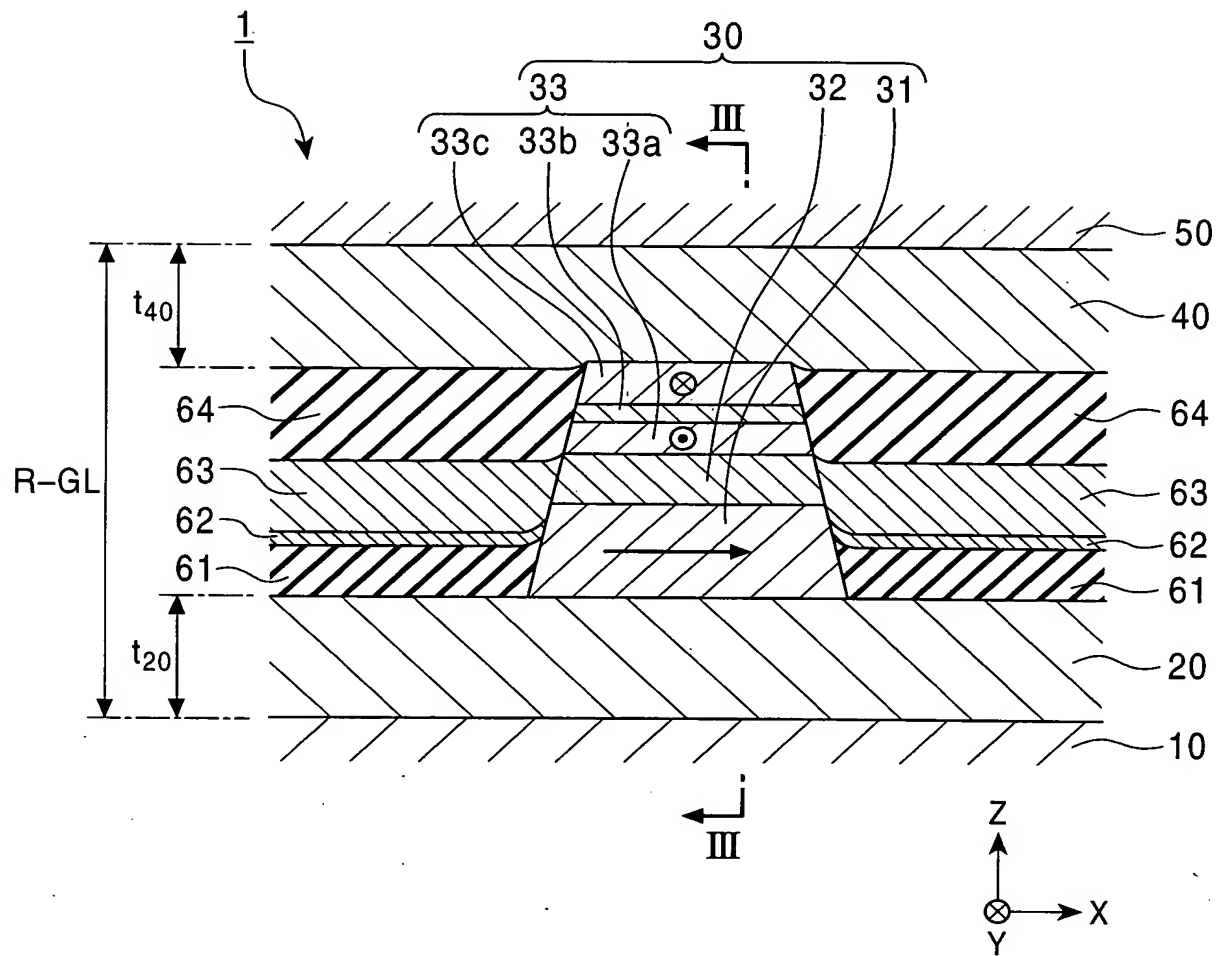


1 / 37

FIG. 1



2 / 37

FIG. 2

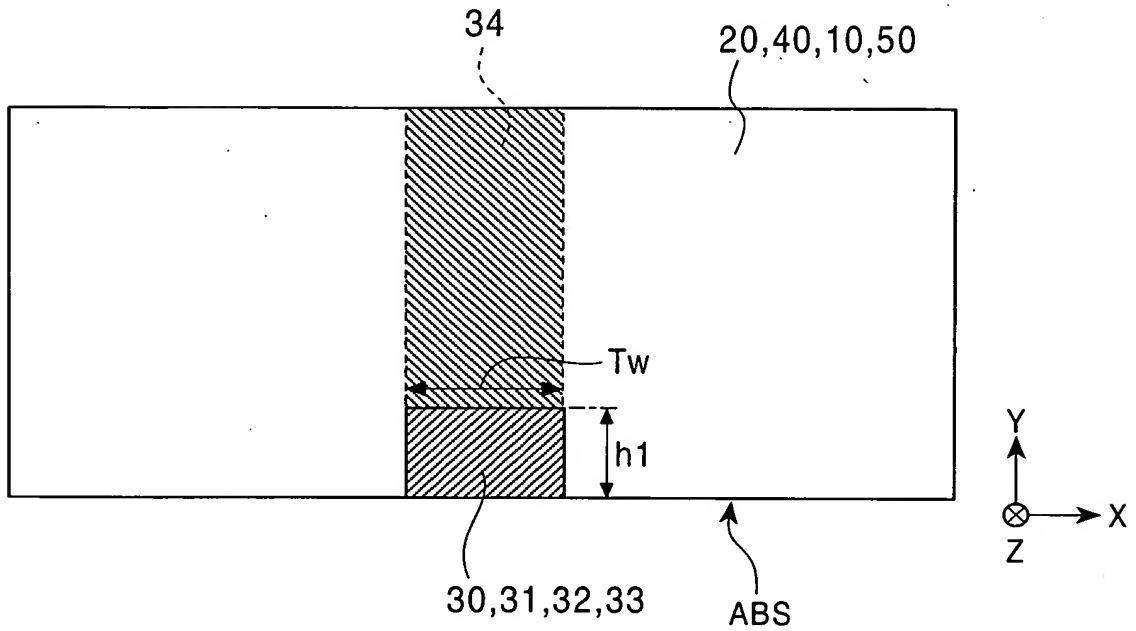
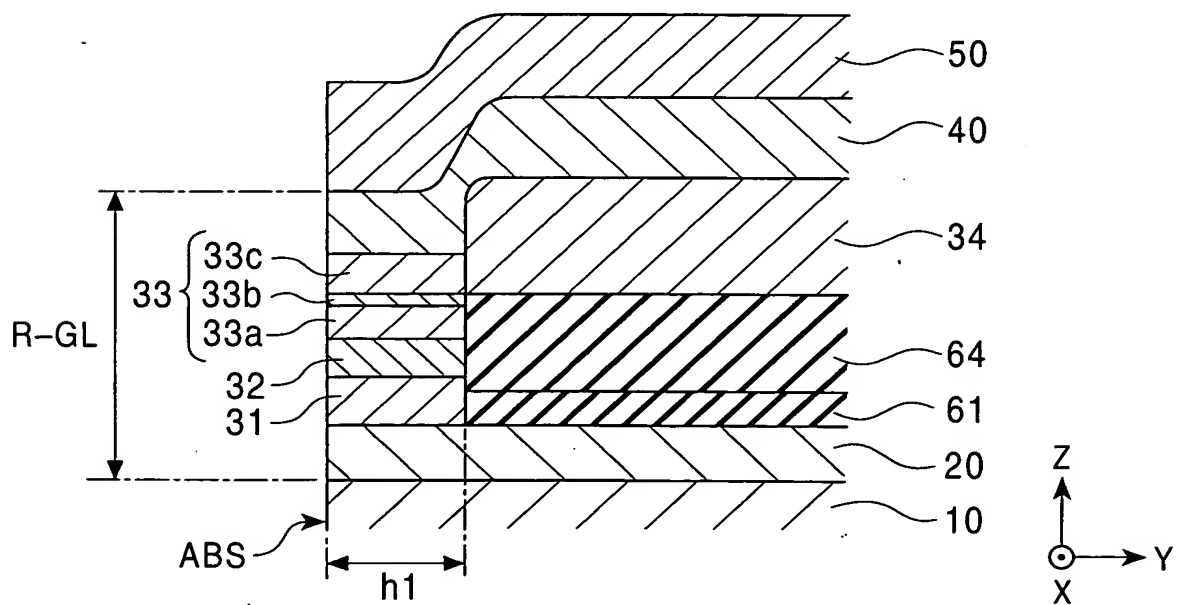


FIG. 3



3 / 37

FIG. 4

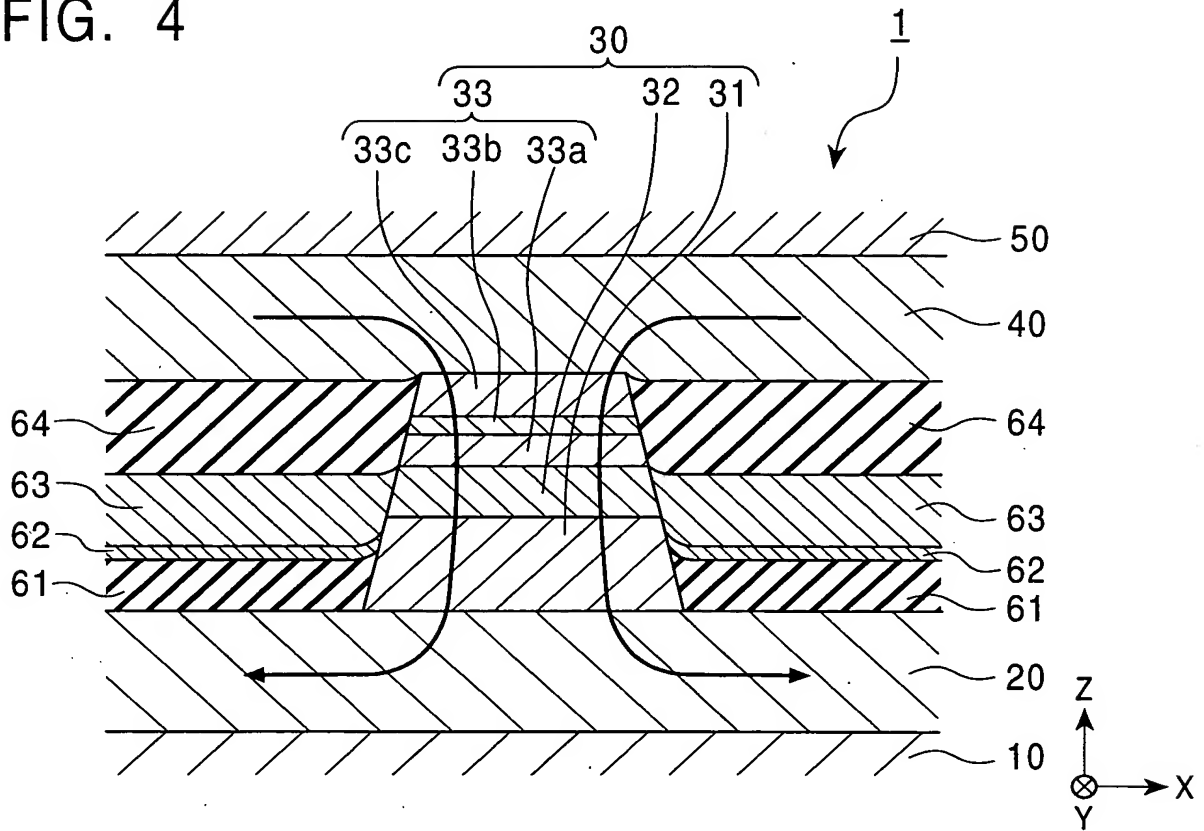


FIG. 5

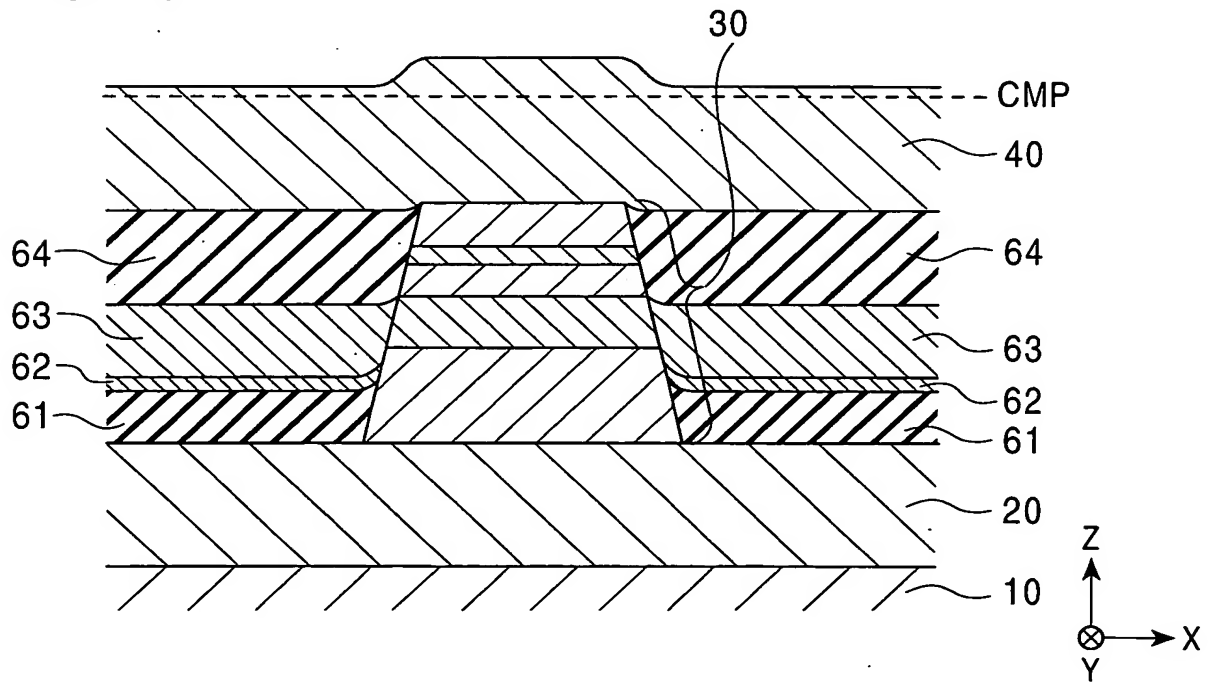
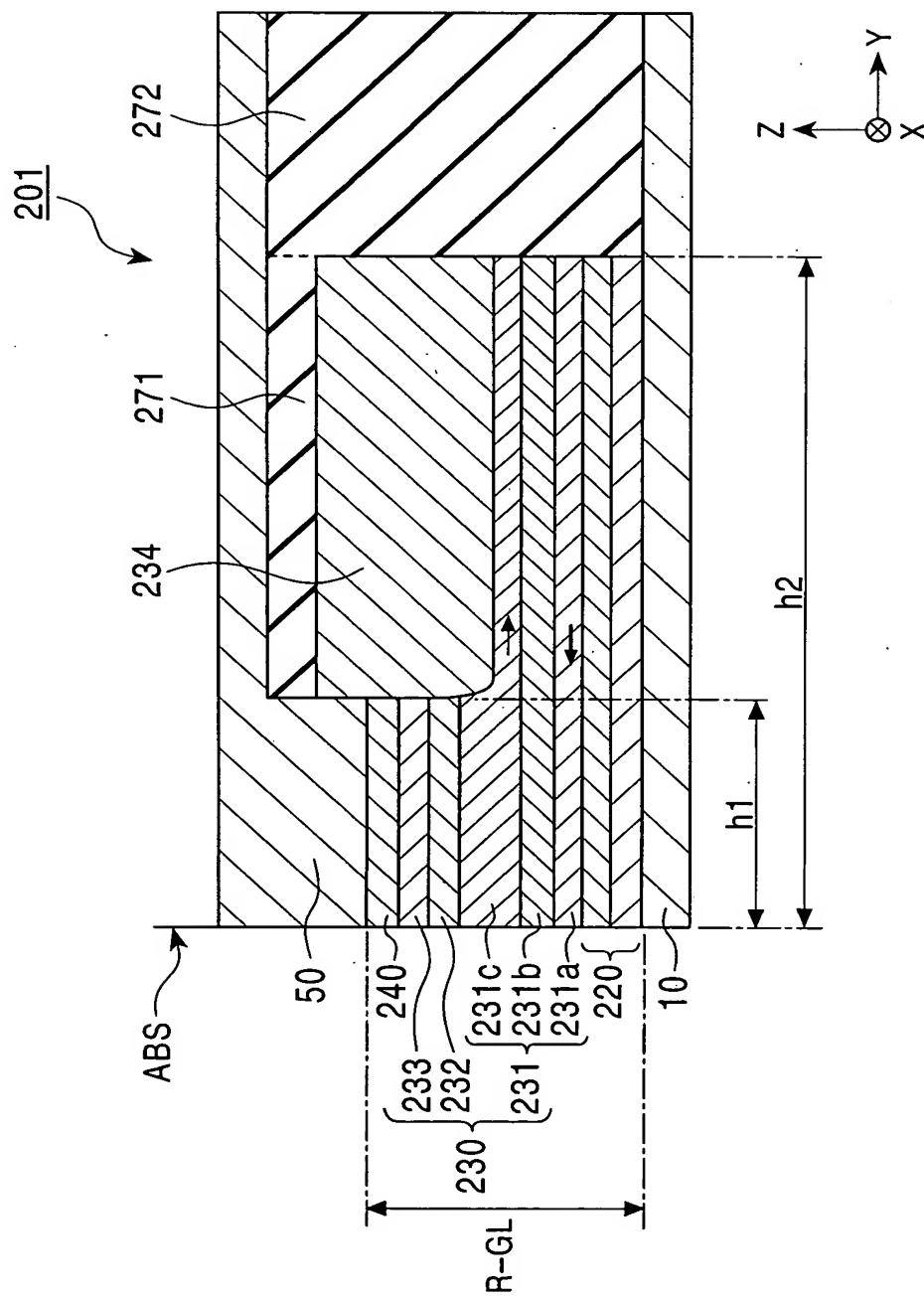


FIG. 6



5 / 37

FIG. 7

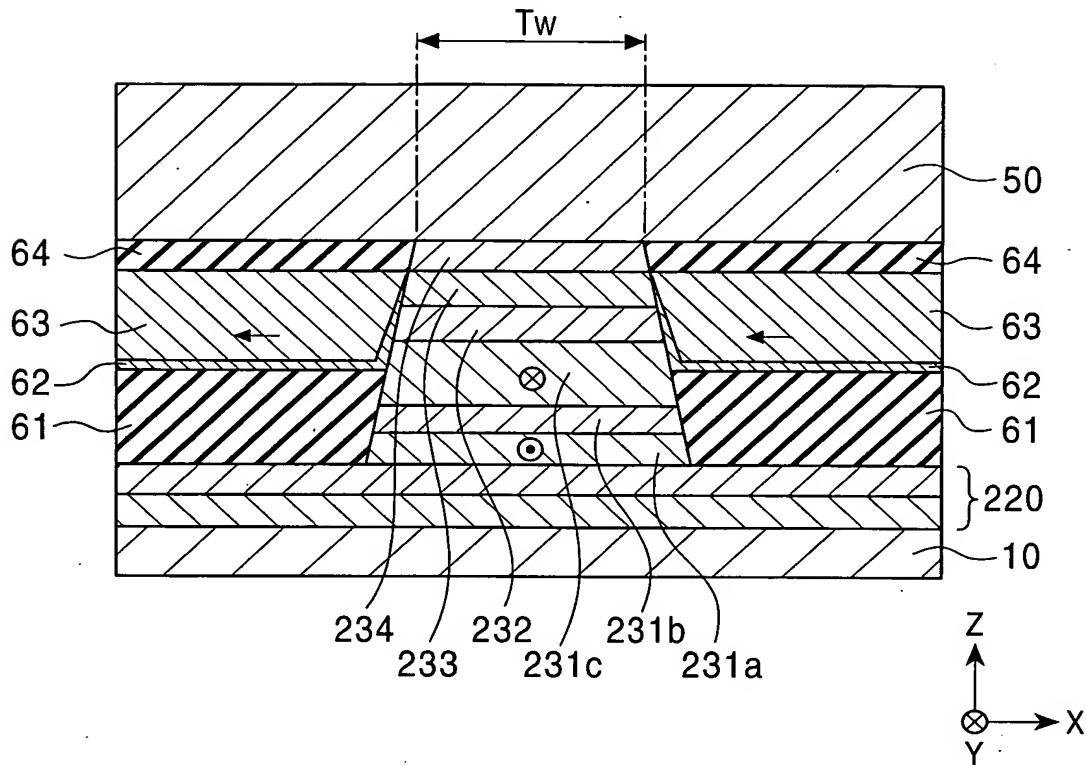
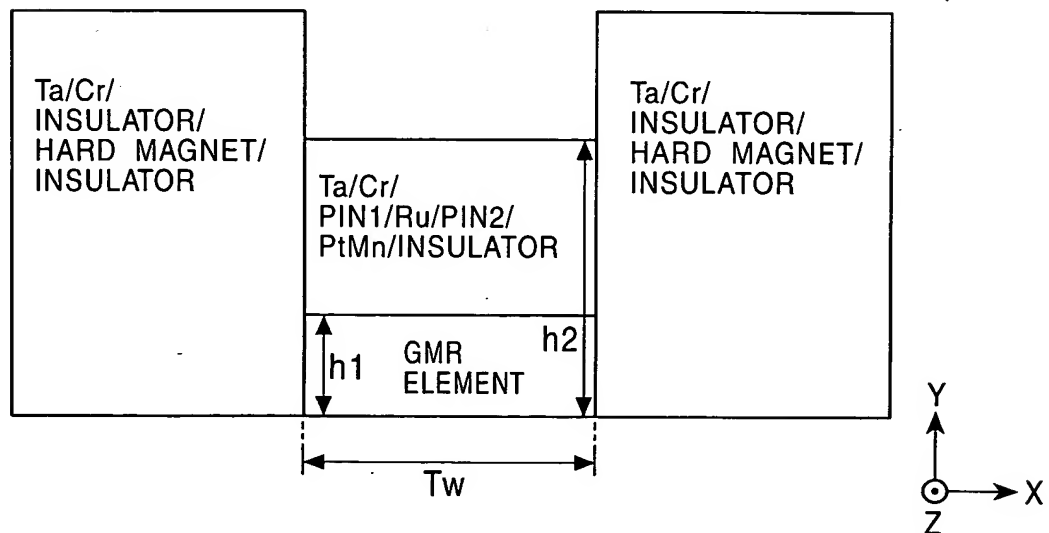


FIG. 8



6 / 37

FIG. 9A

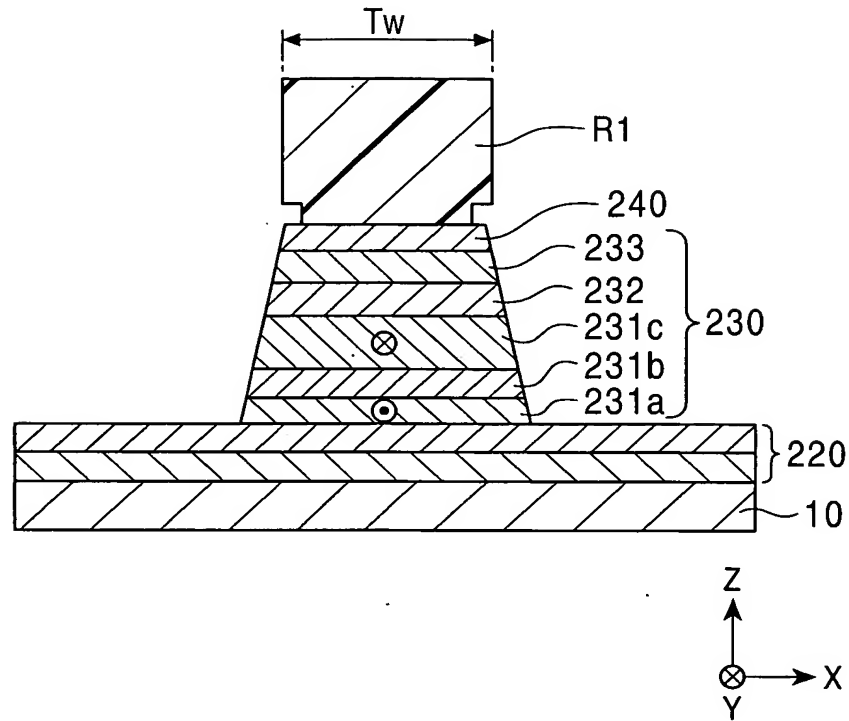
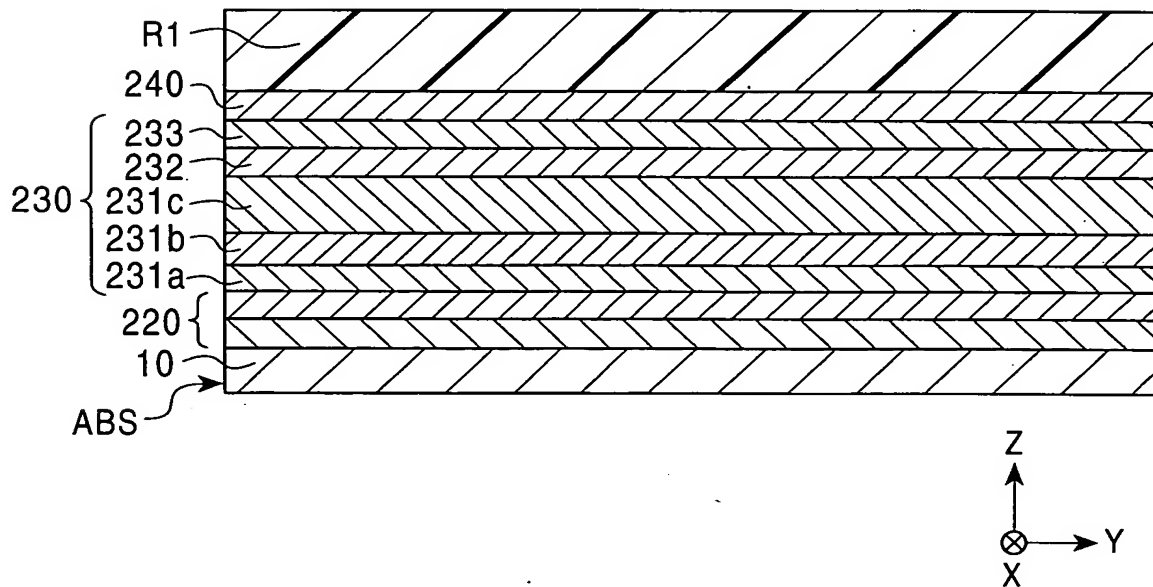


FIG. 9B



7 / 37

FIG. 10A

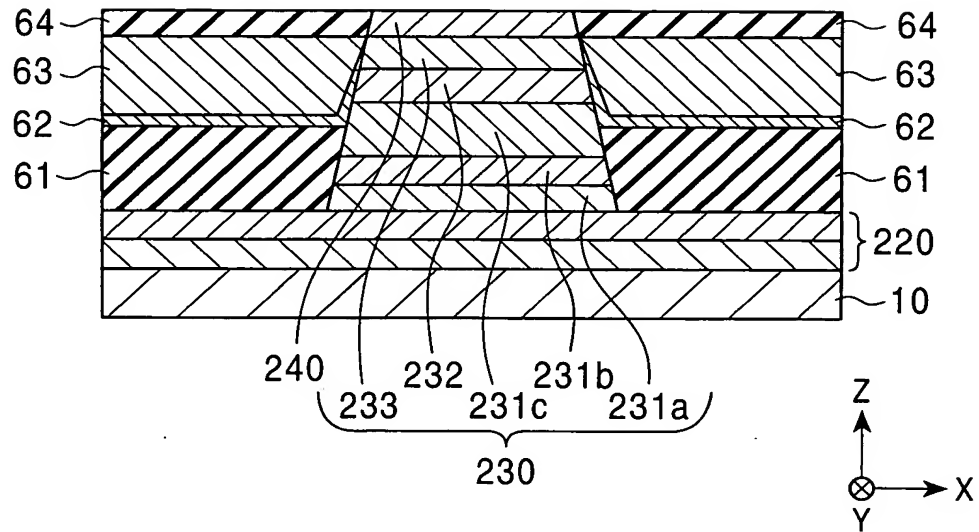
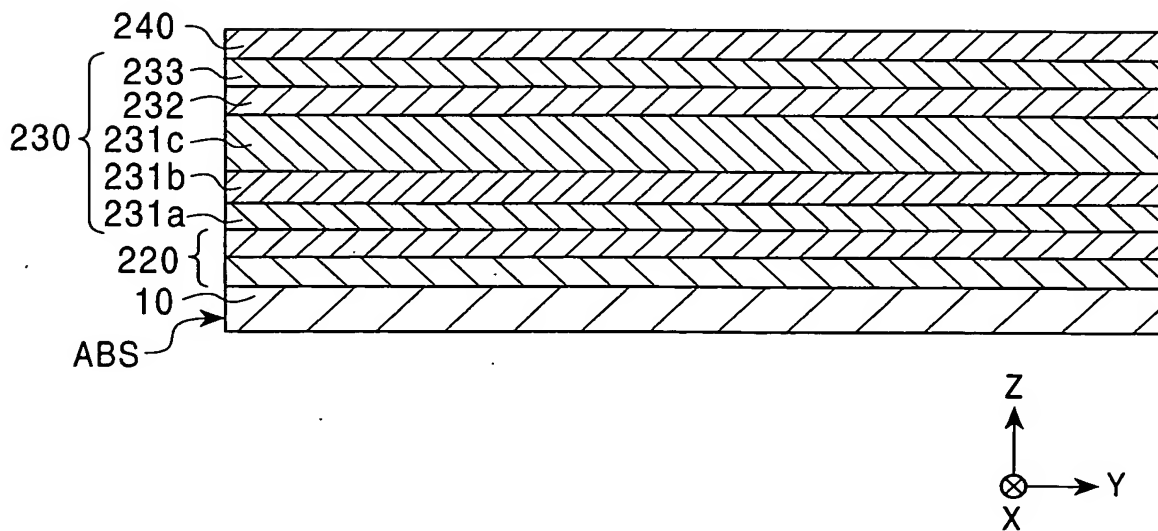


FIG. 10B



8 / 37

FIG. 11A

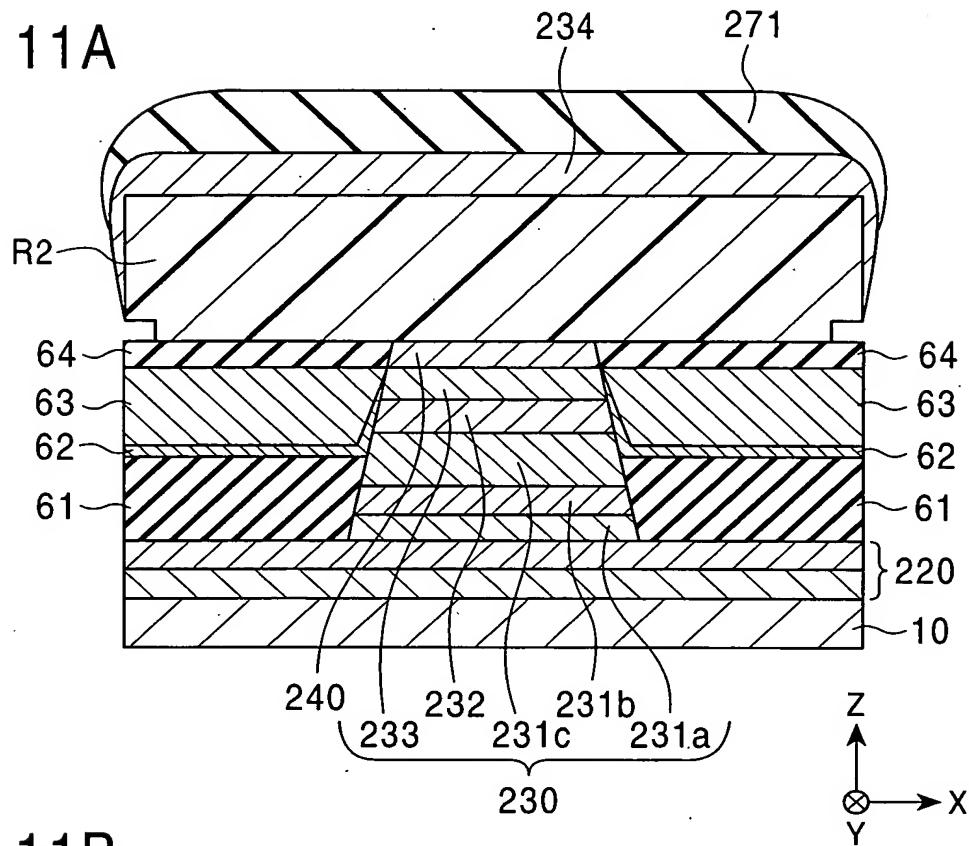


FIG. 11B

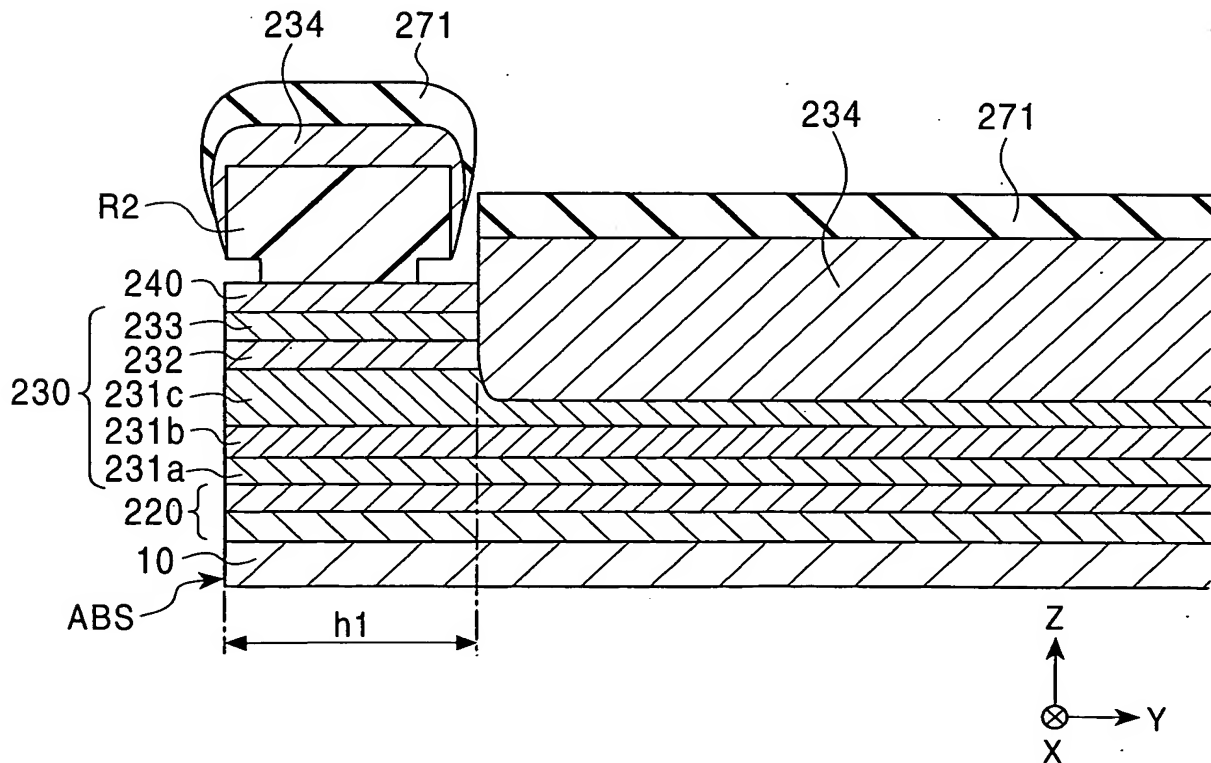


FIG. 12A

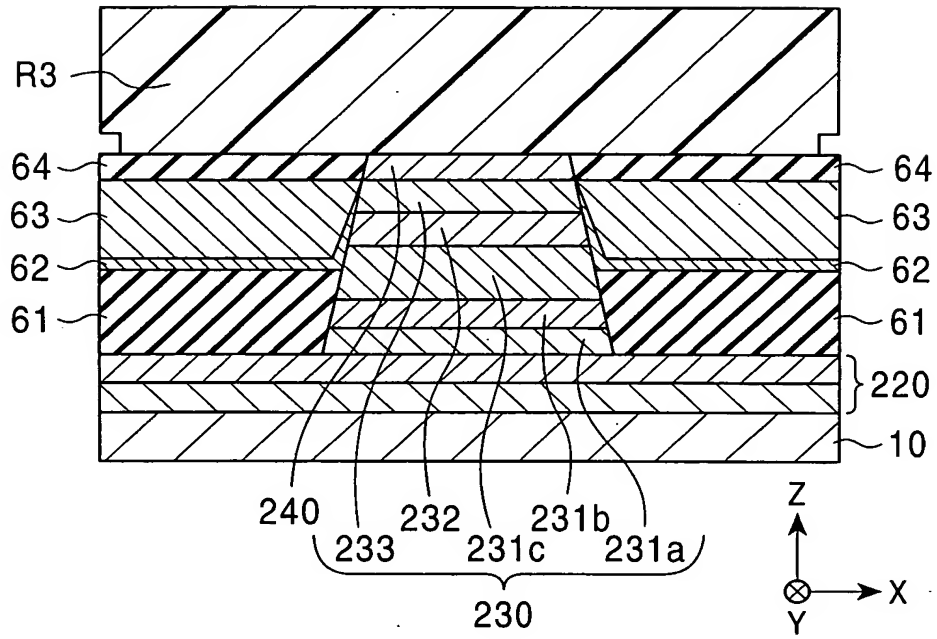
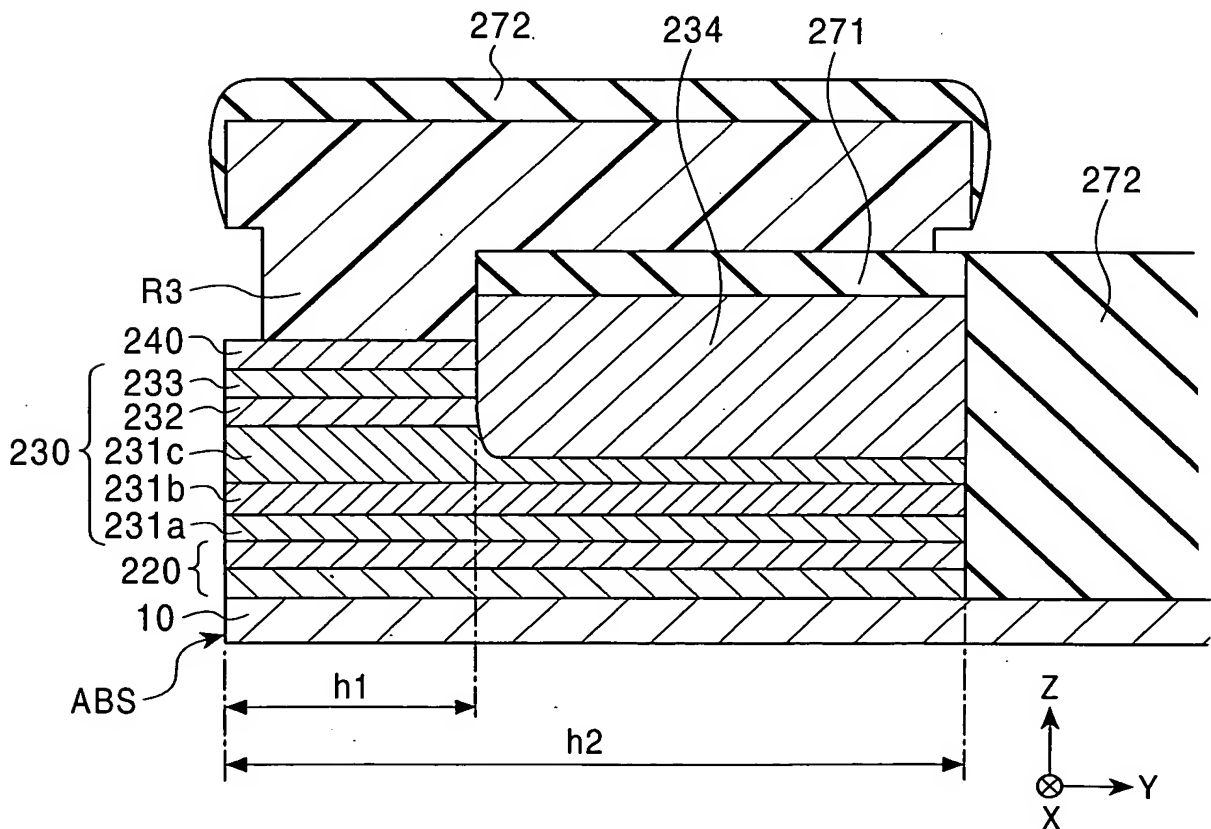
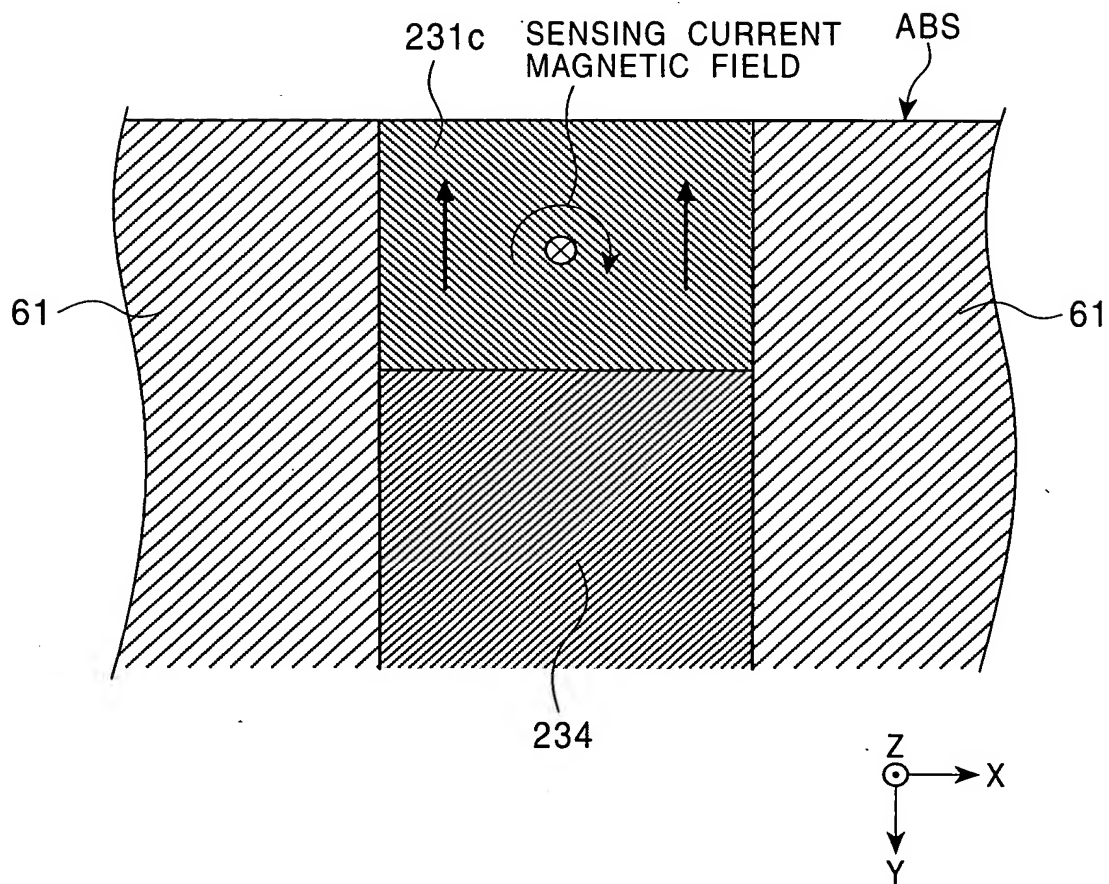


FIG. 12B



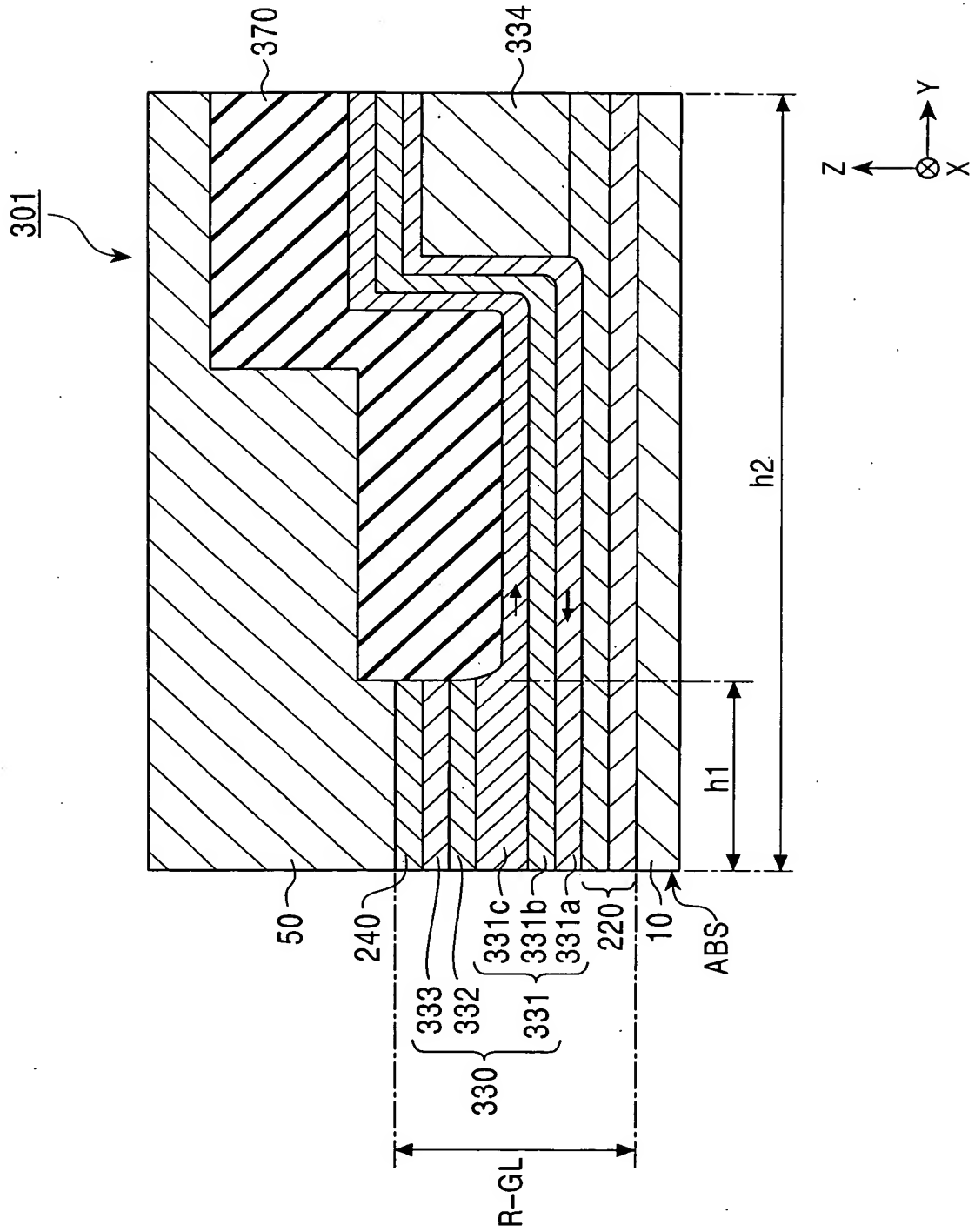
10 / 37

FIG. 13



11 / 37

FIG. 14



The diagram illustrates the cross-sectional structure of a GMR element. It features a central GMR element (PIN1/Ru/PIN2) with a thickness h_1 , sandwiched between two Ta/Cr layers with a thickness h_2 . The entire structure is surrounded by Ta/Cr/INSULATOR/HARD MAGNET/INSULATOR layers. The width of the GMR element is T_w . A coordinate system (X, Y, Z) is shown at the bottom right, with Z pointing out of the page.

13 / 37

FIG. 17

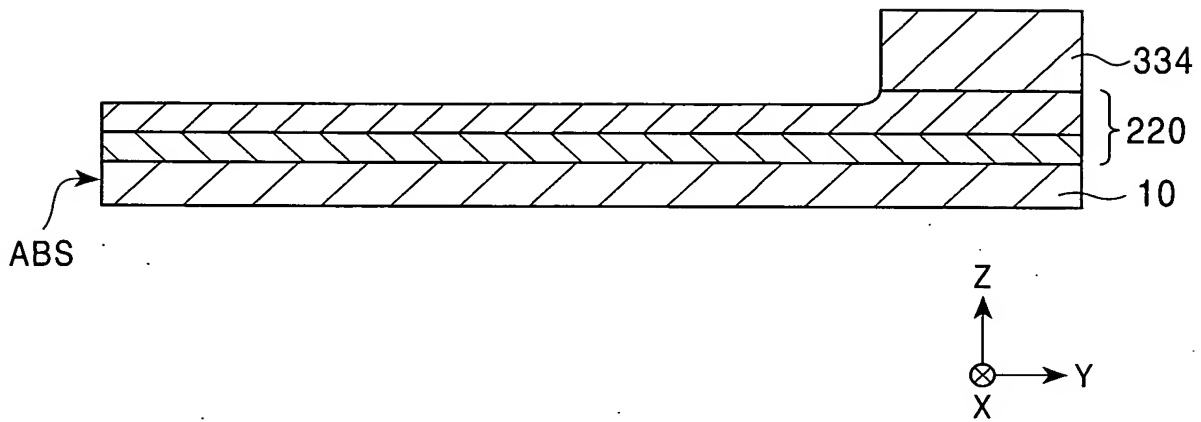
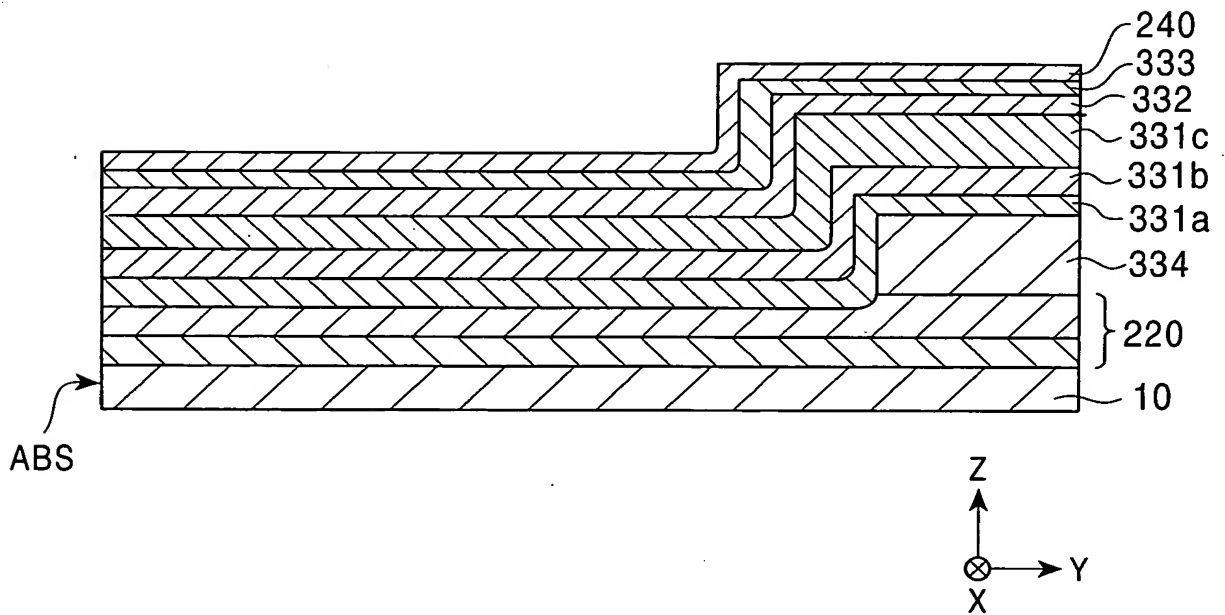
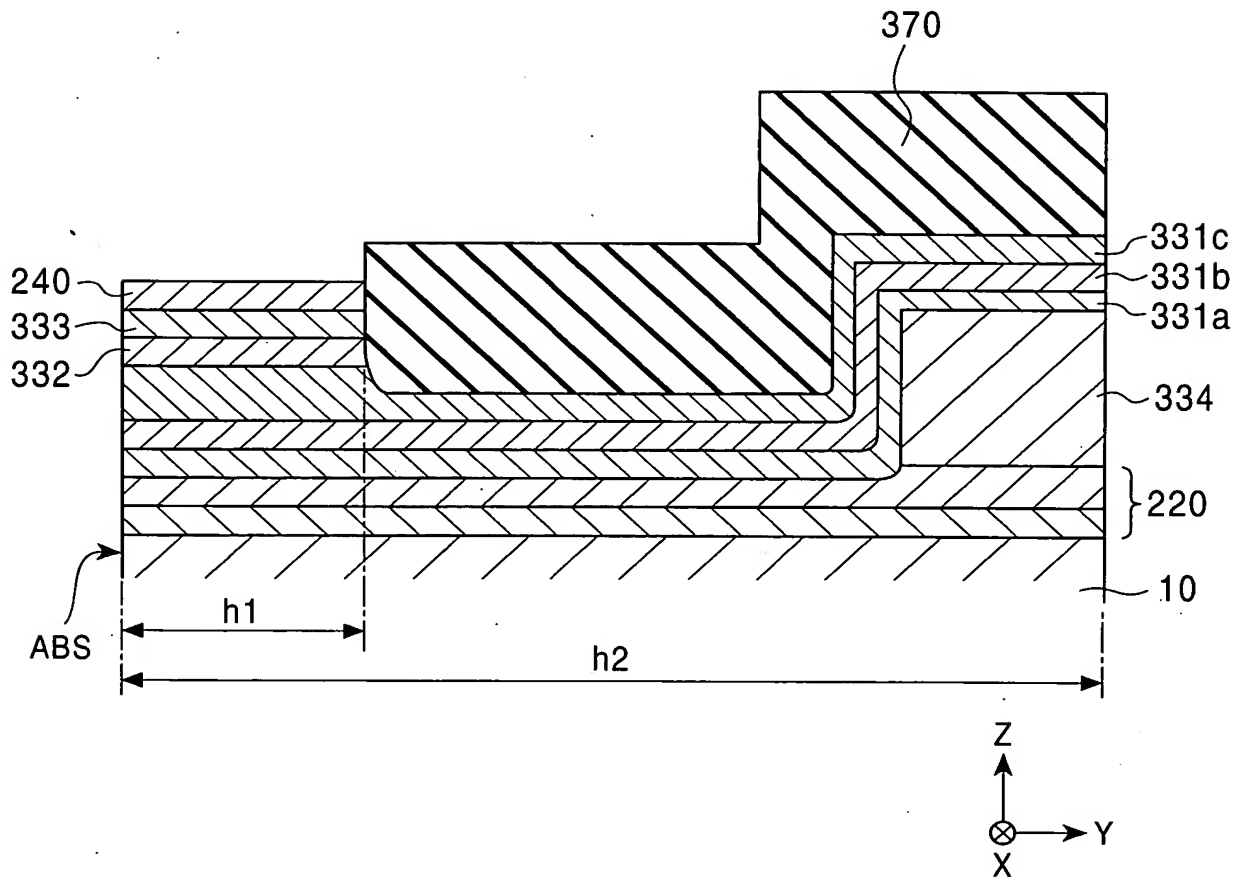


FIG. 18



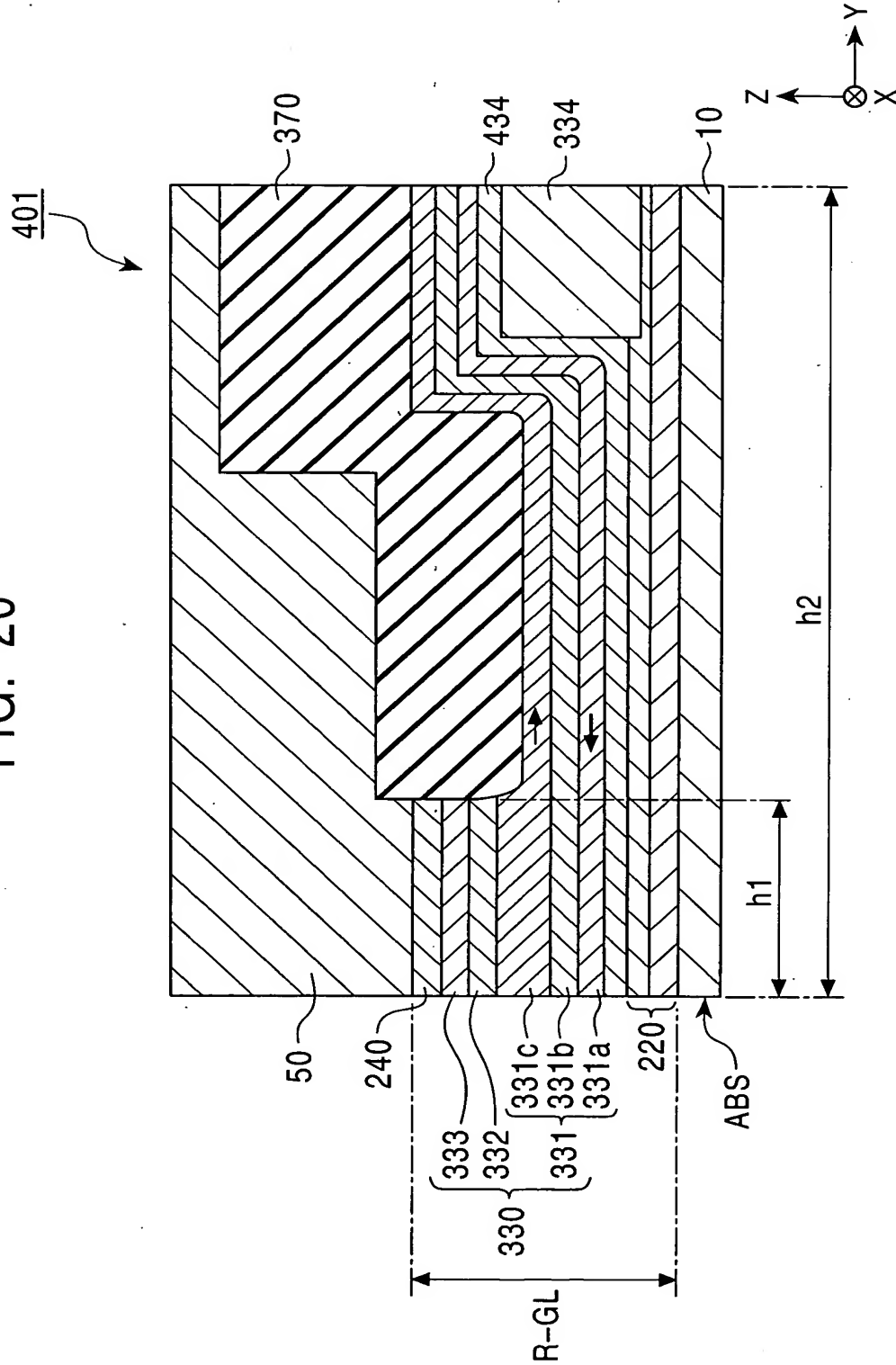
14 / 37

FIG. 19



15 / 37

FIG. 20



16 / 37

FIG. 21

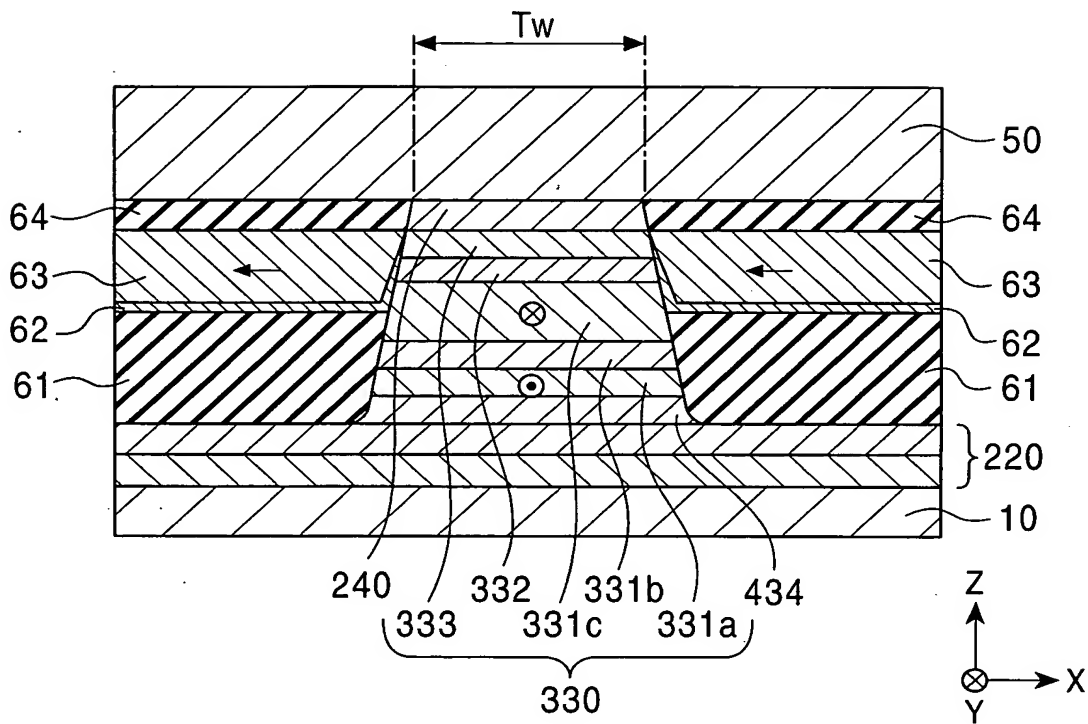
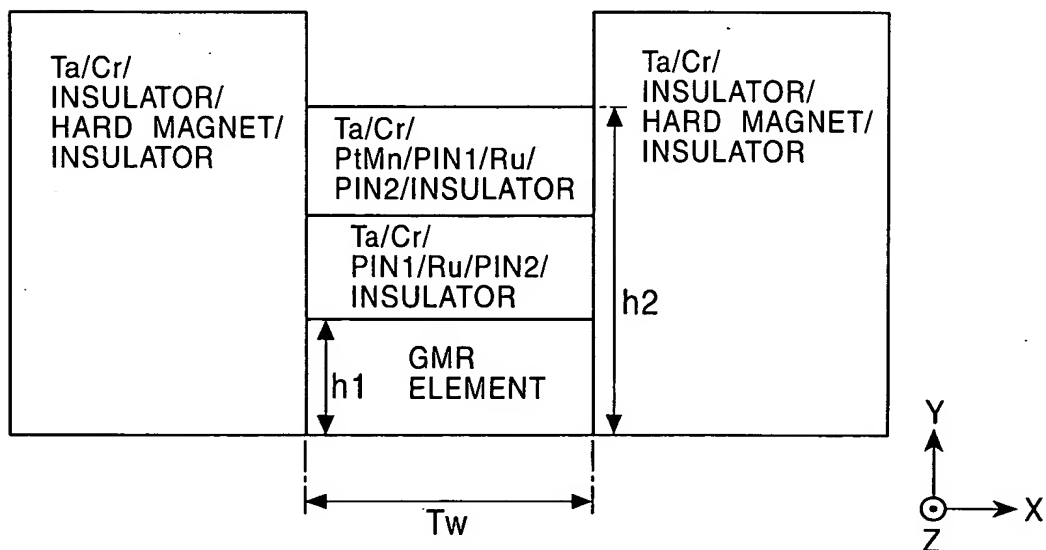
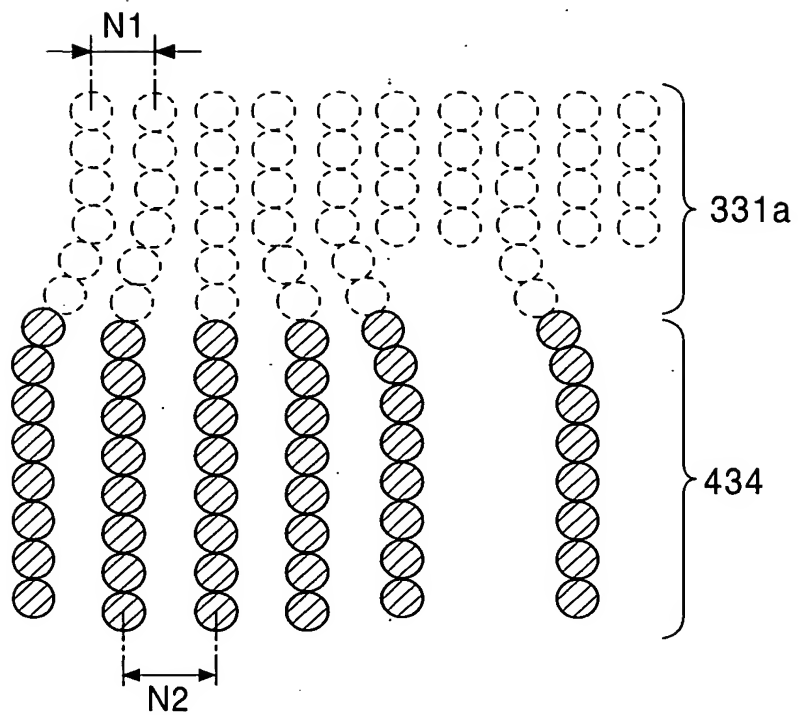


FIG. 22



17 / 37

FIG. 23



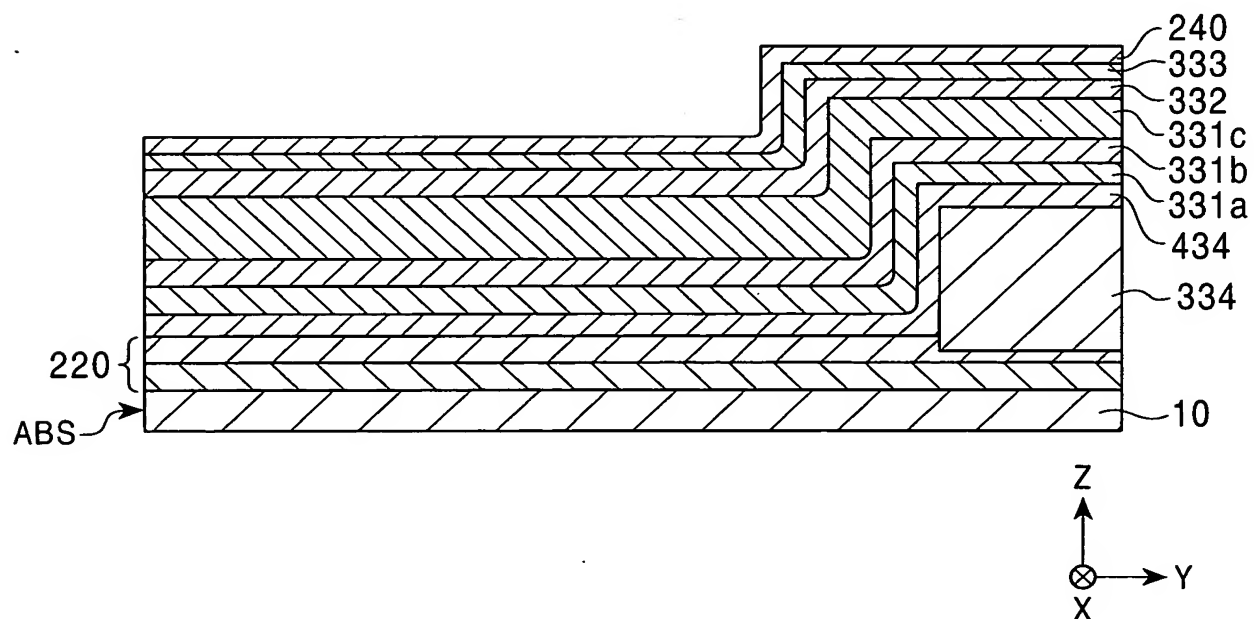
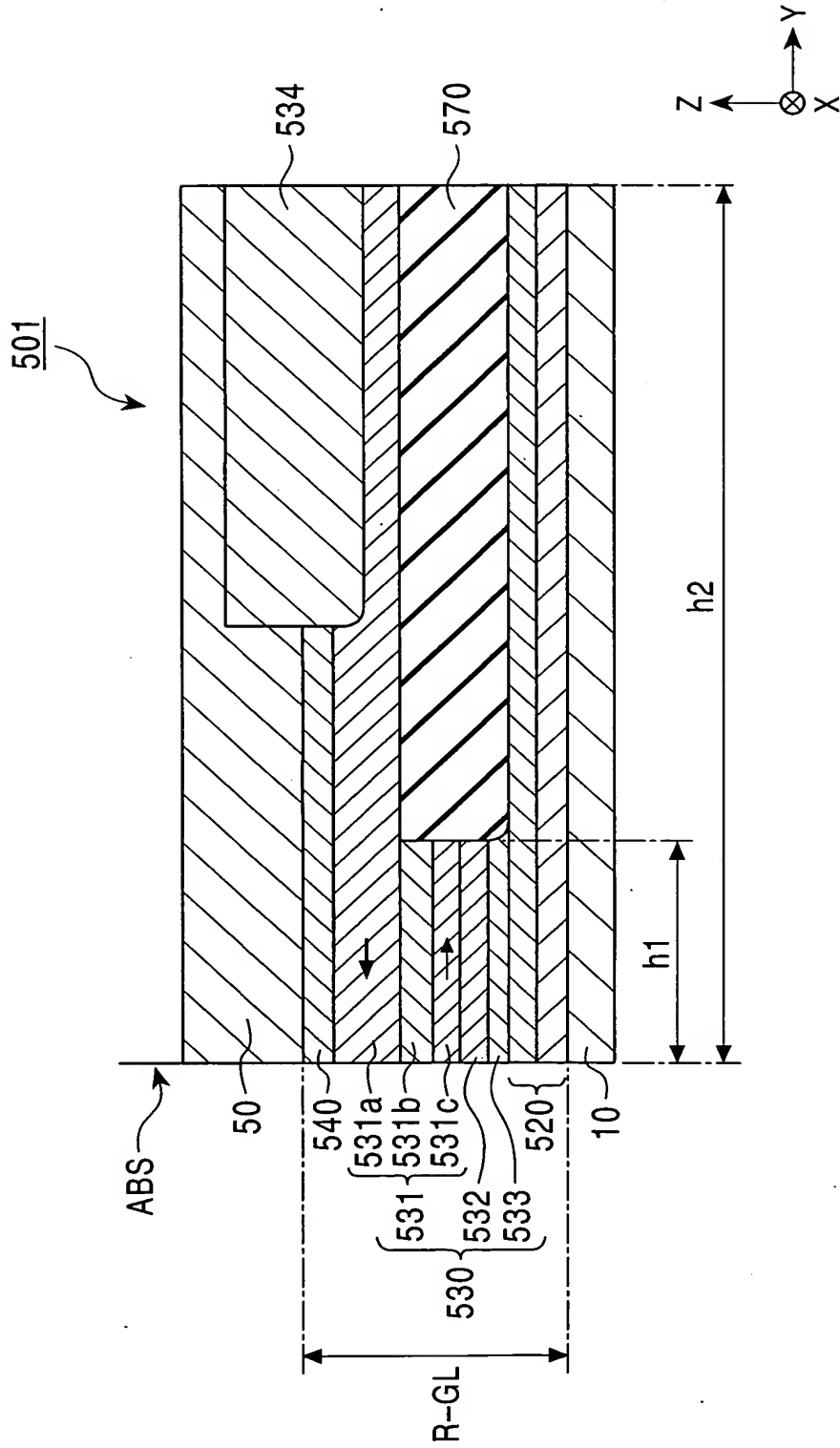


FIG. 26



20 / 37

FIG. 27

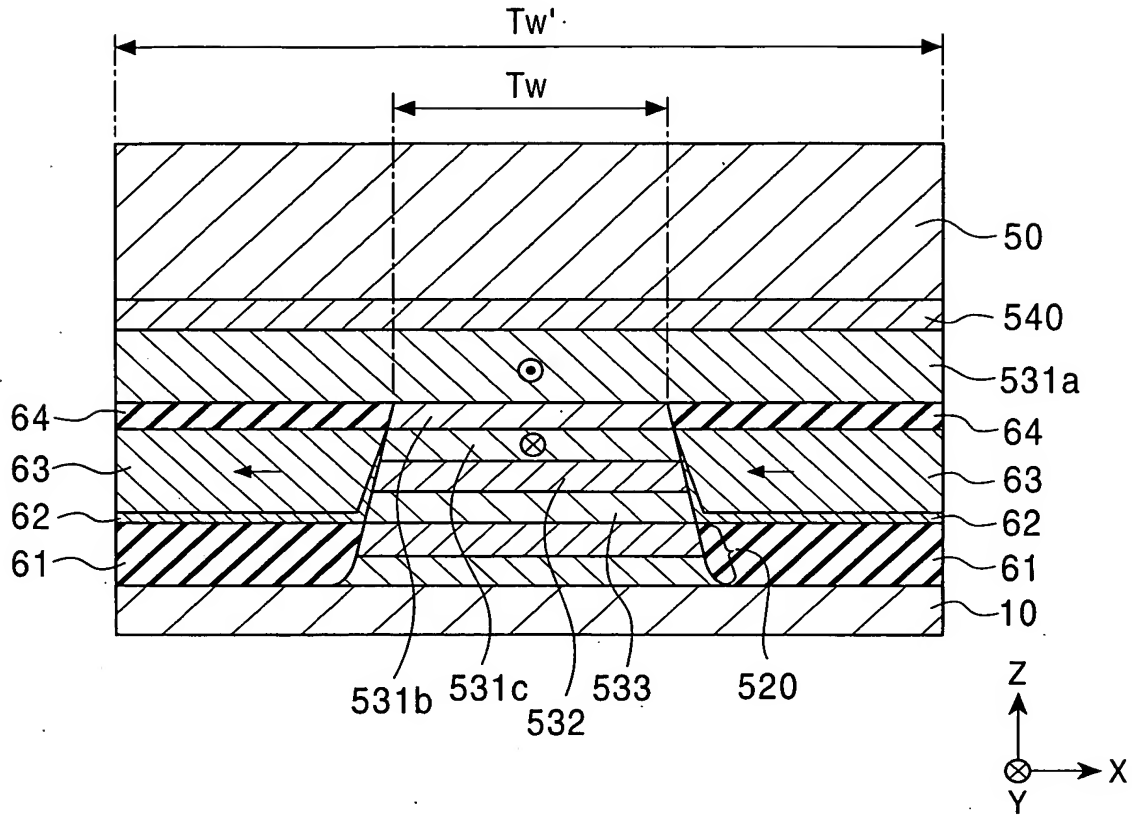
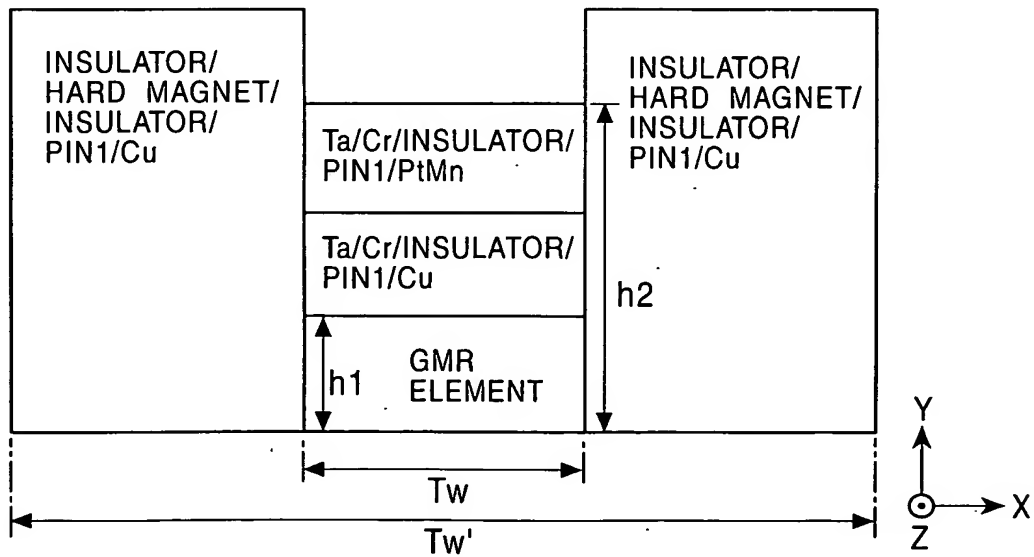
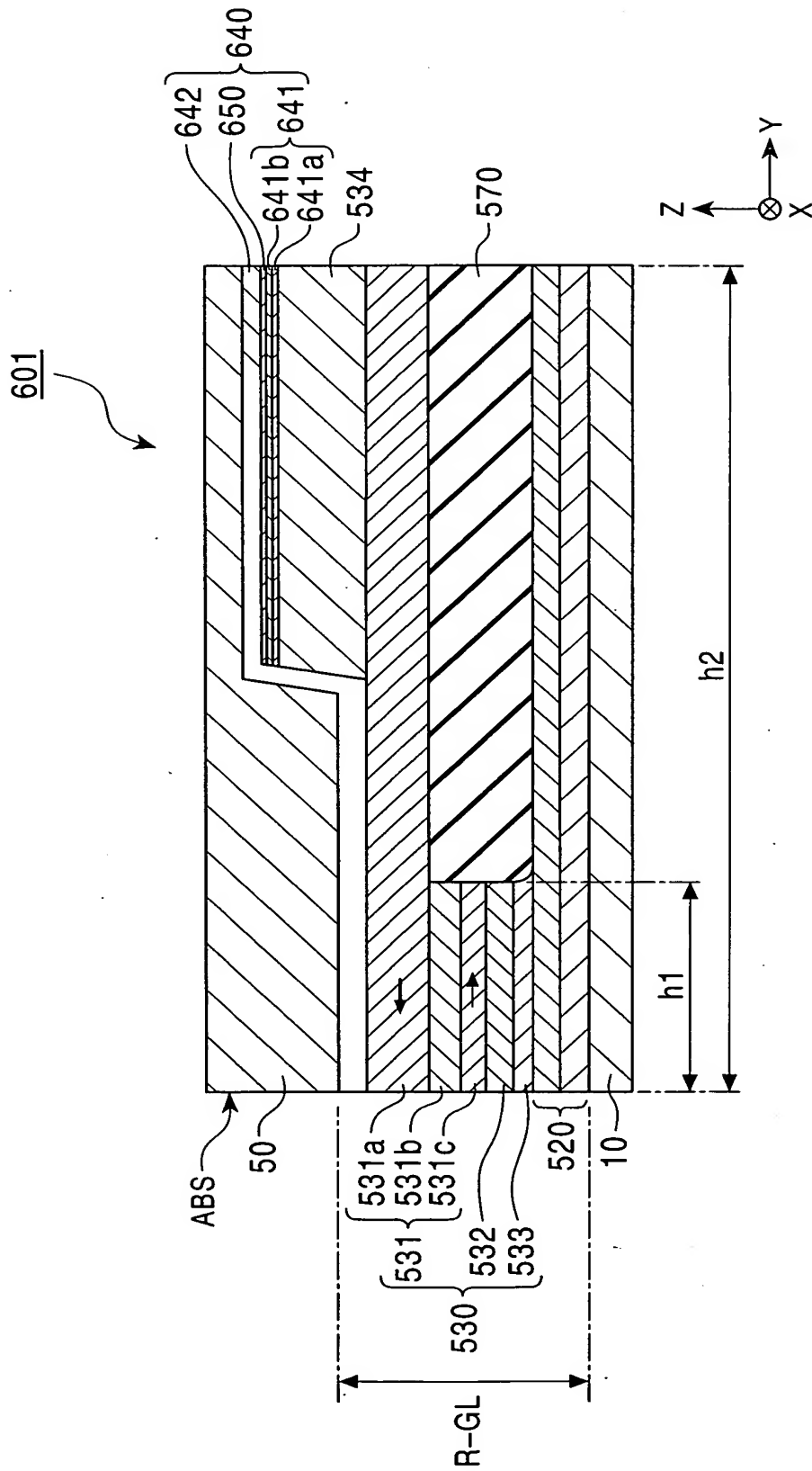


FIG. 28



21 / 37

FIG. 29



22 / 37

FIG. 30

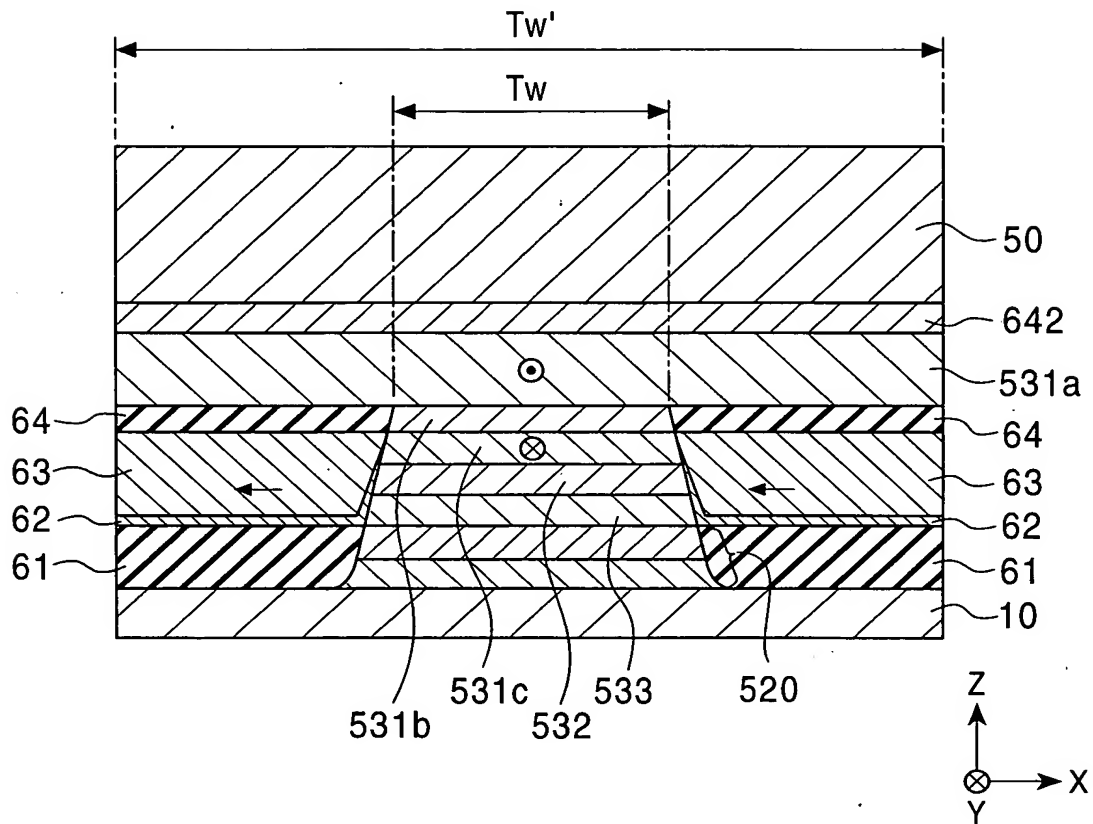
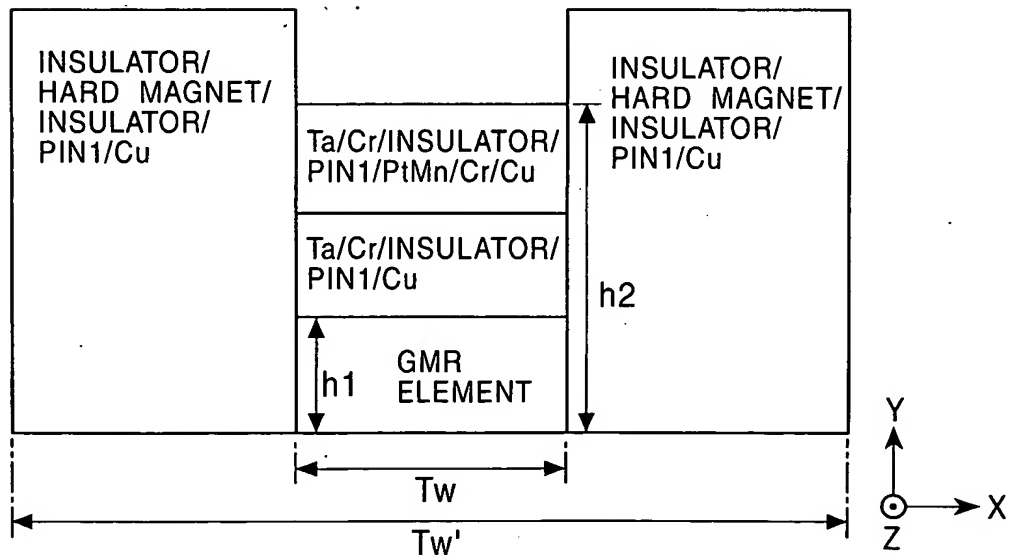


FIG. 31



23 / 37

FIG. 32

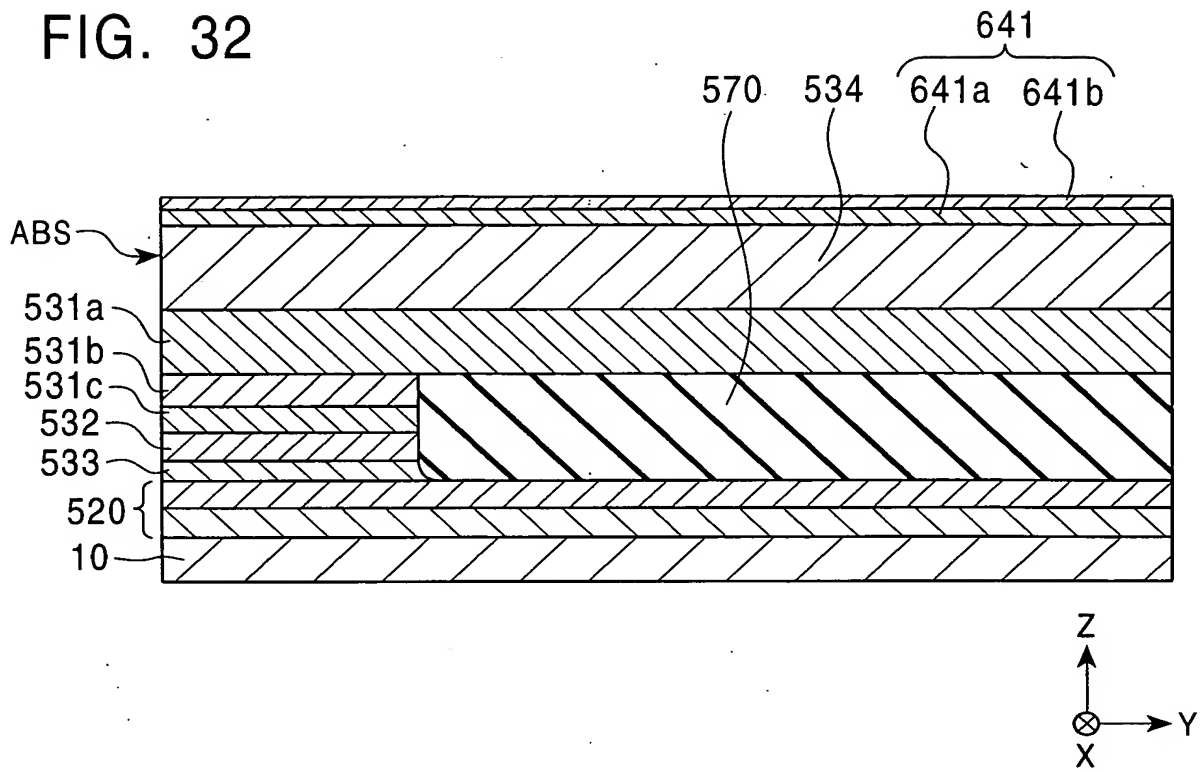
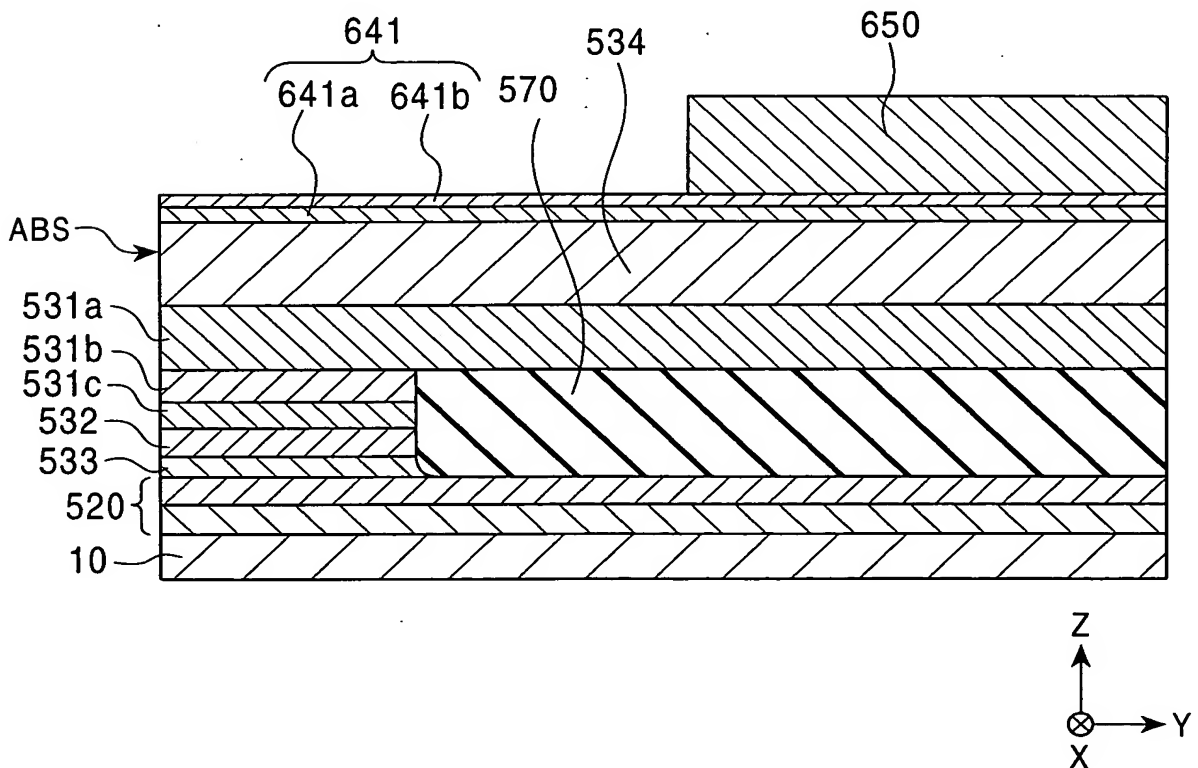


FIG. 33



24 / 37

FIG. 34

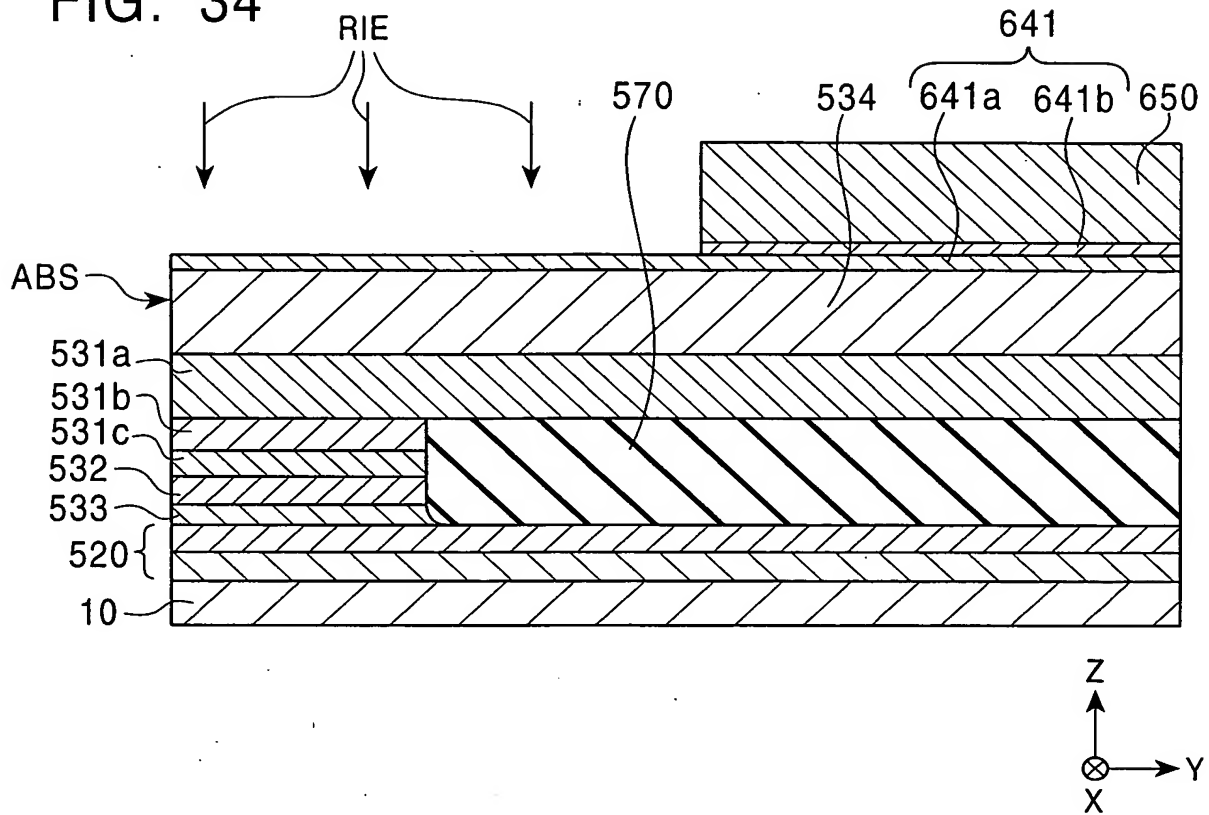
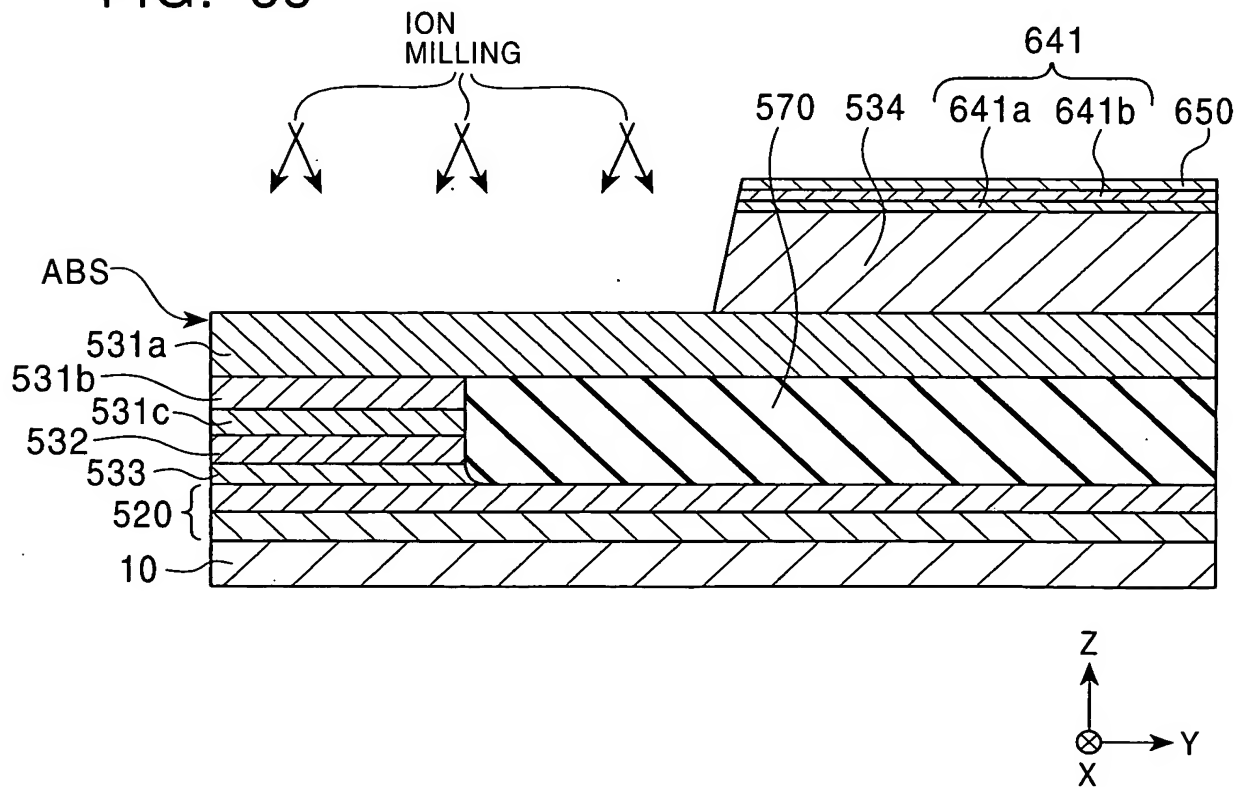
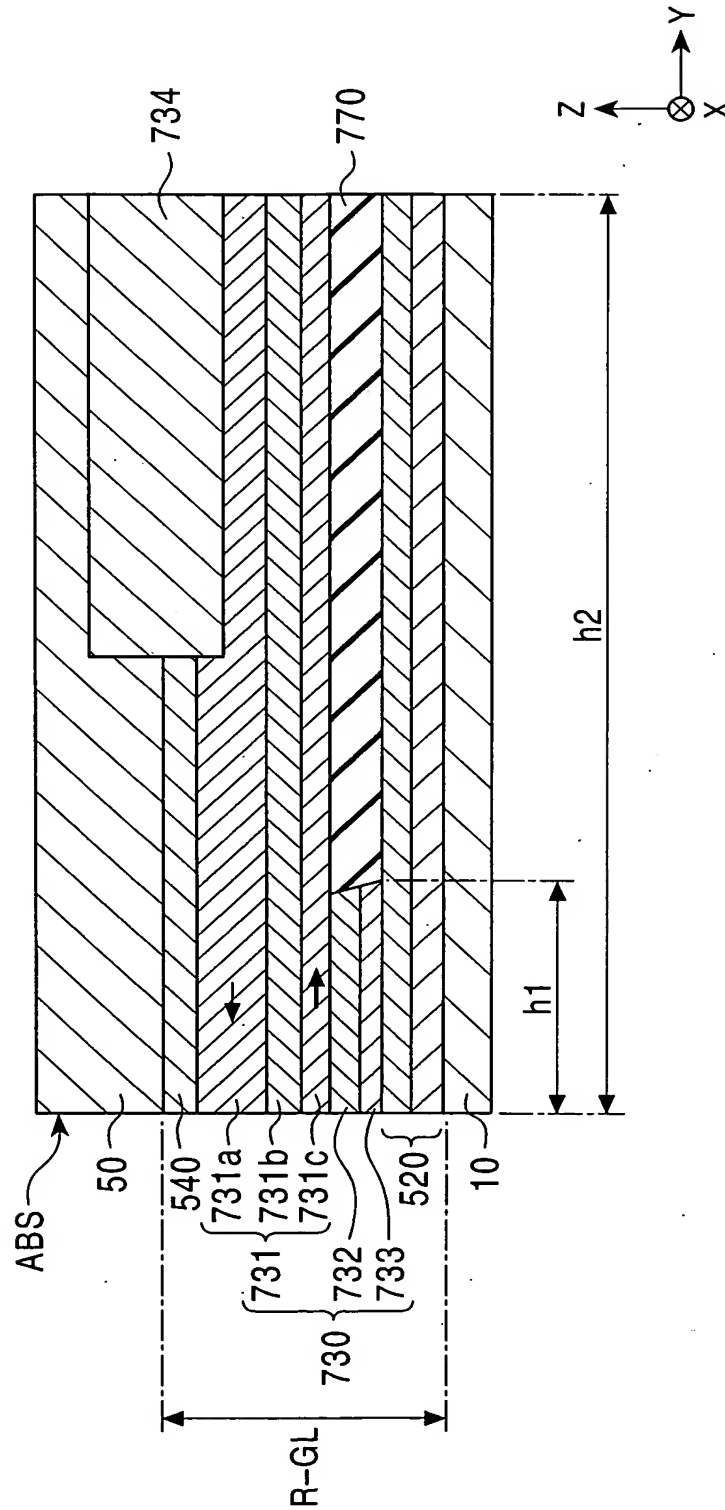


FIG. 35



701 \rightarrow 2



26 / 37

FIG. 37

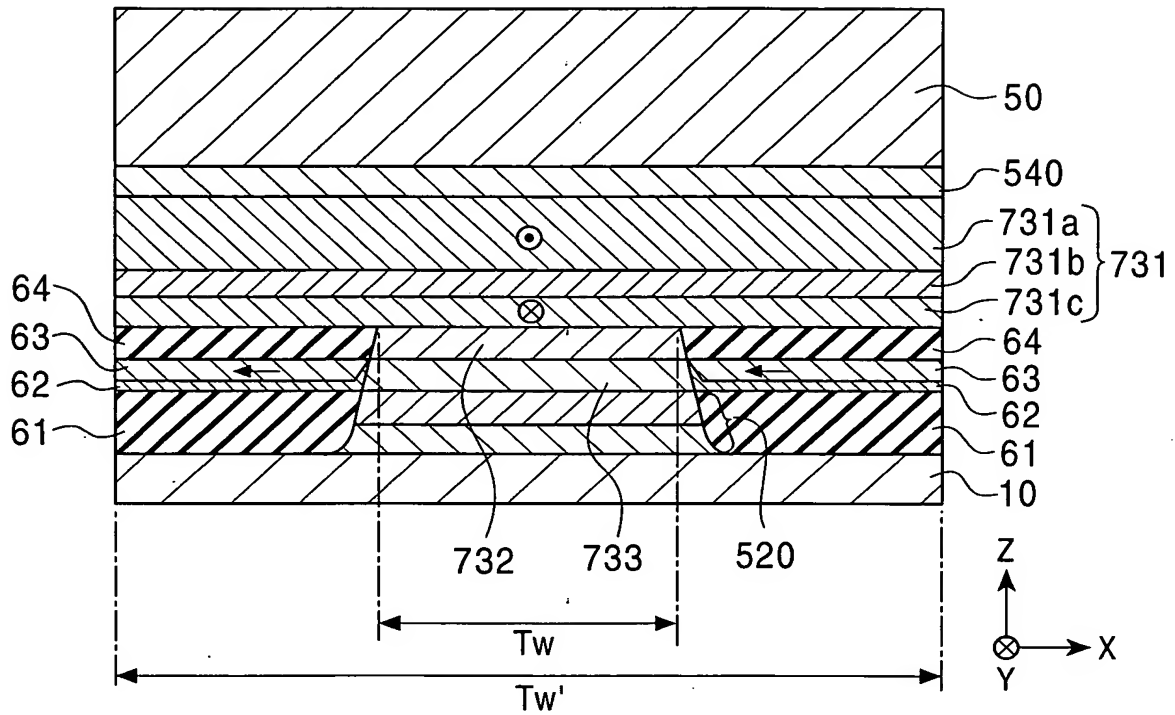
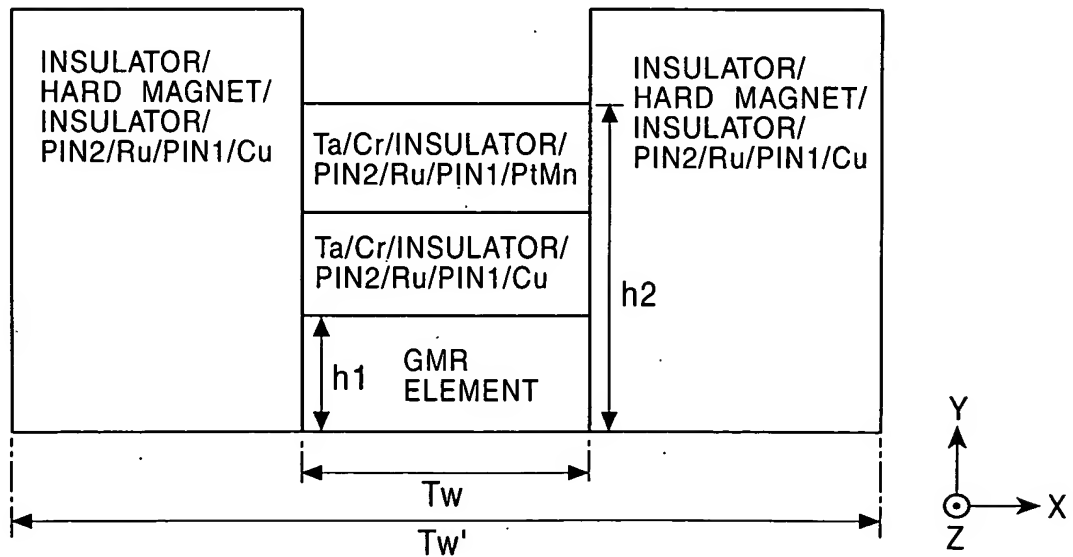


FIG. 38



27 / 37

FIG. 39

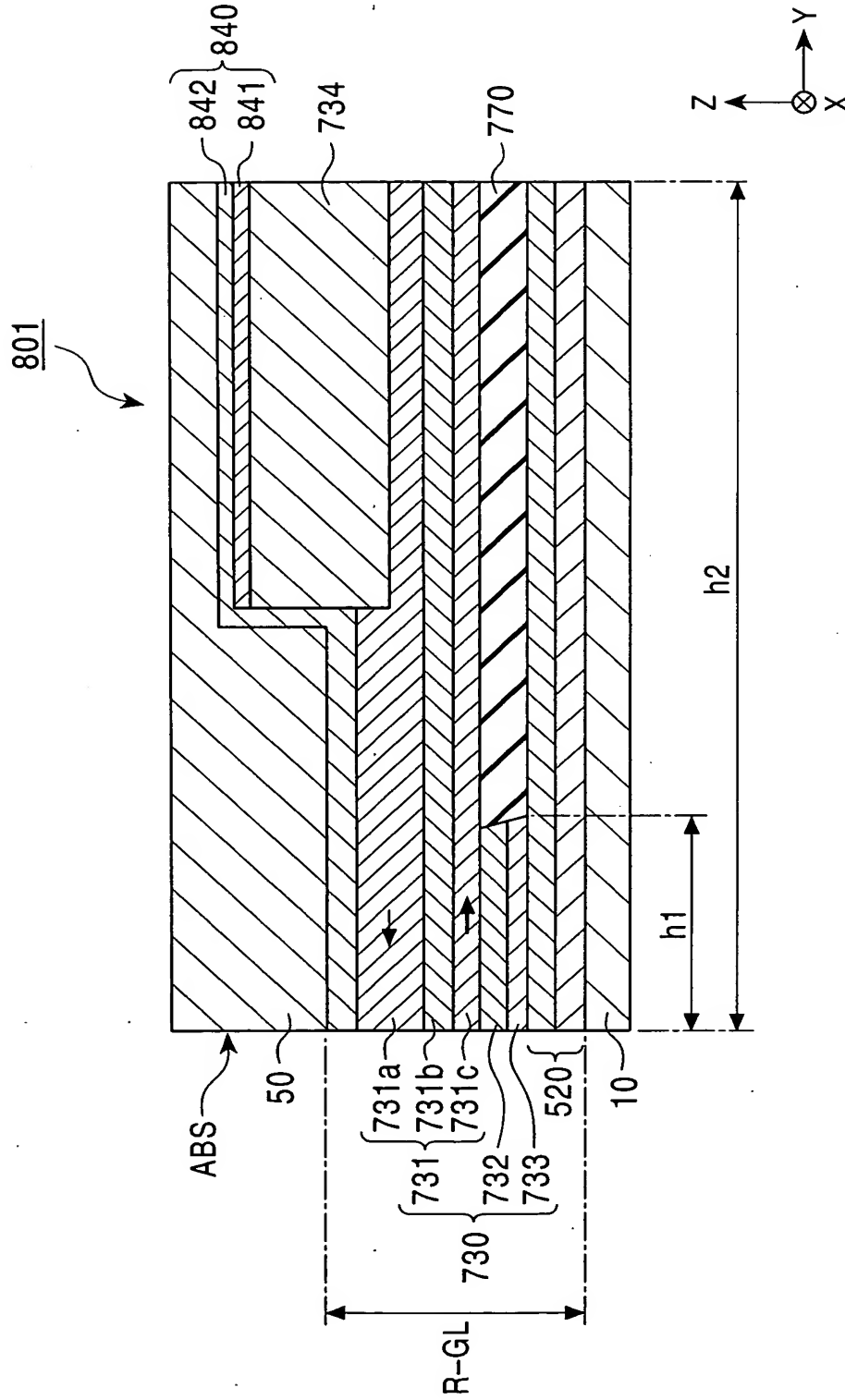


FIG. 40

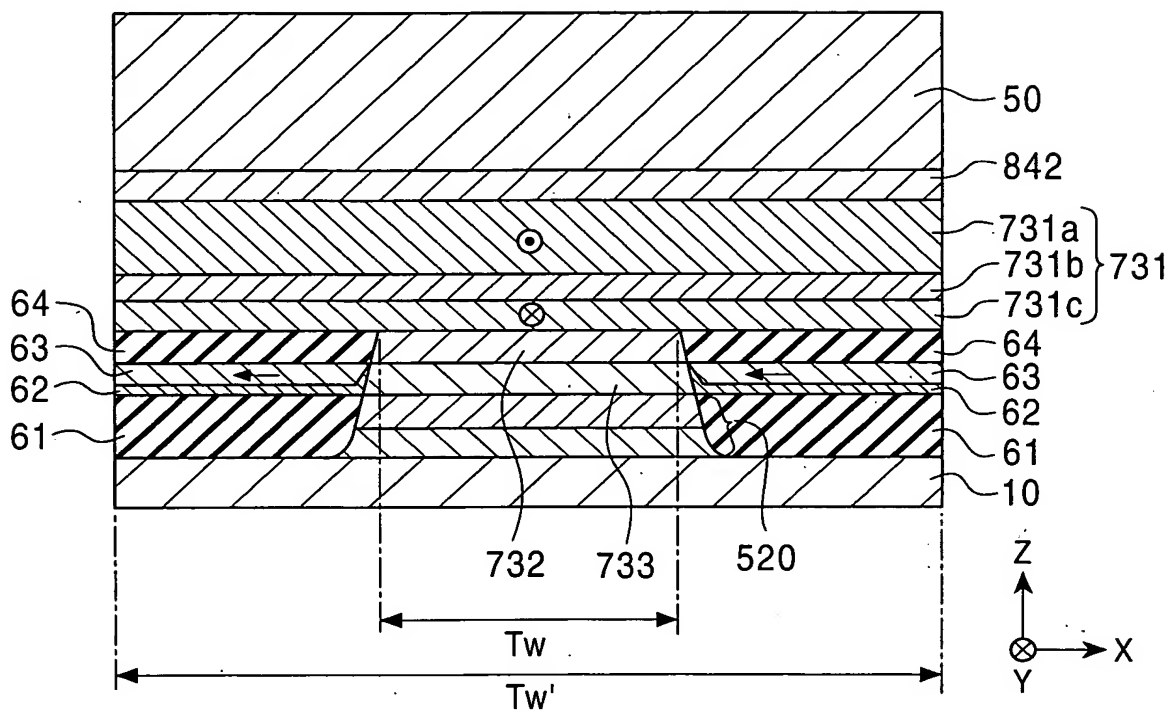
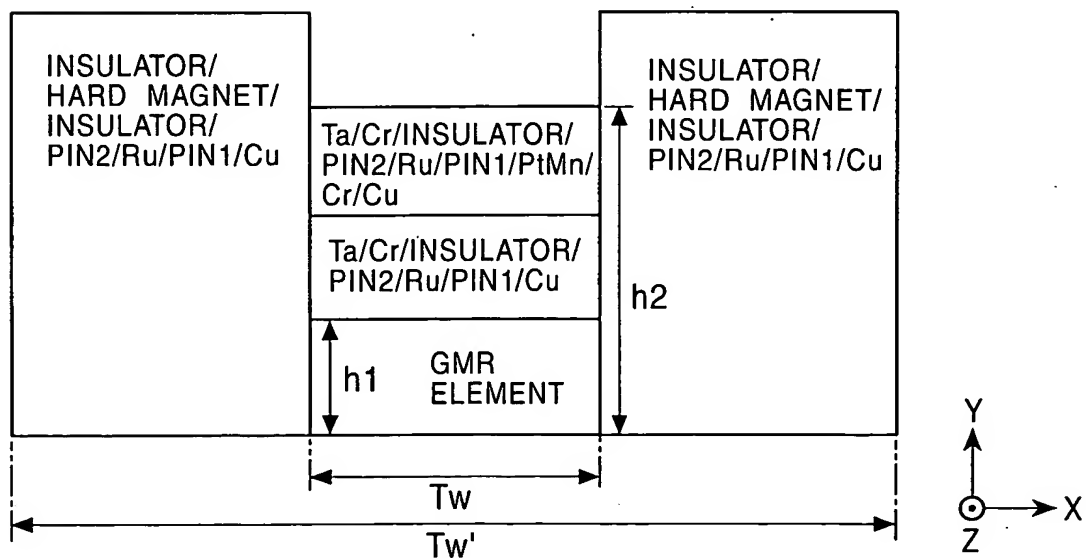
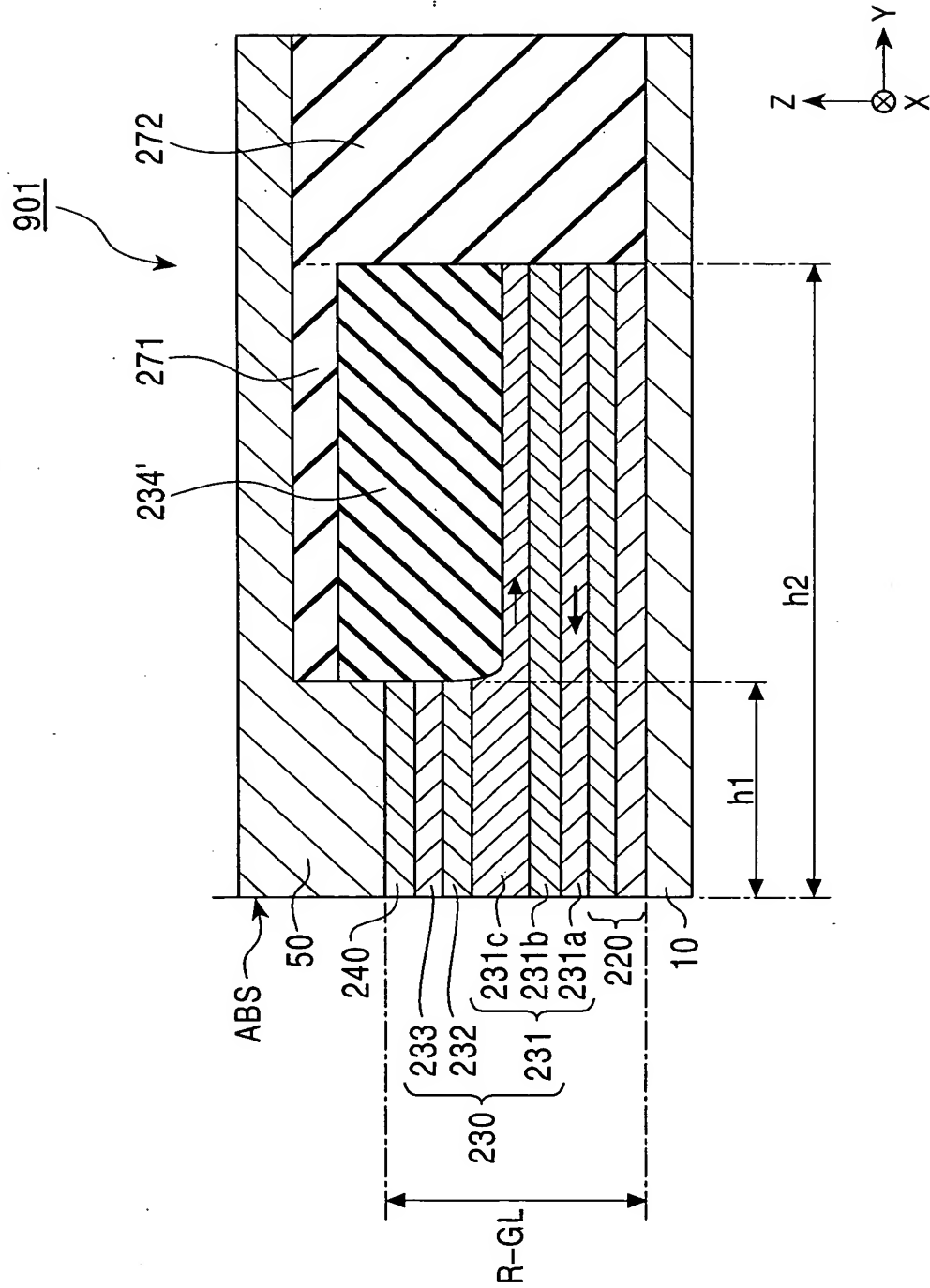


FIG. 41



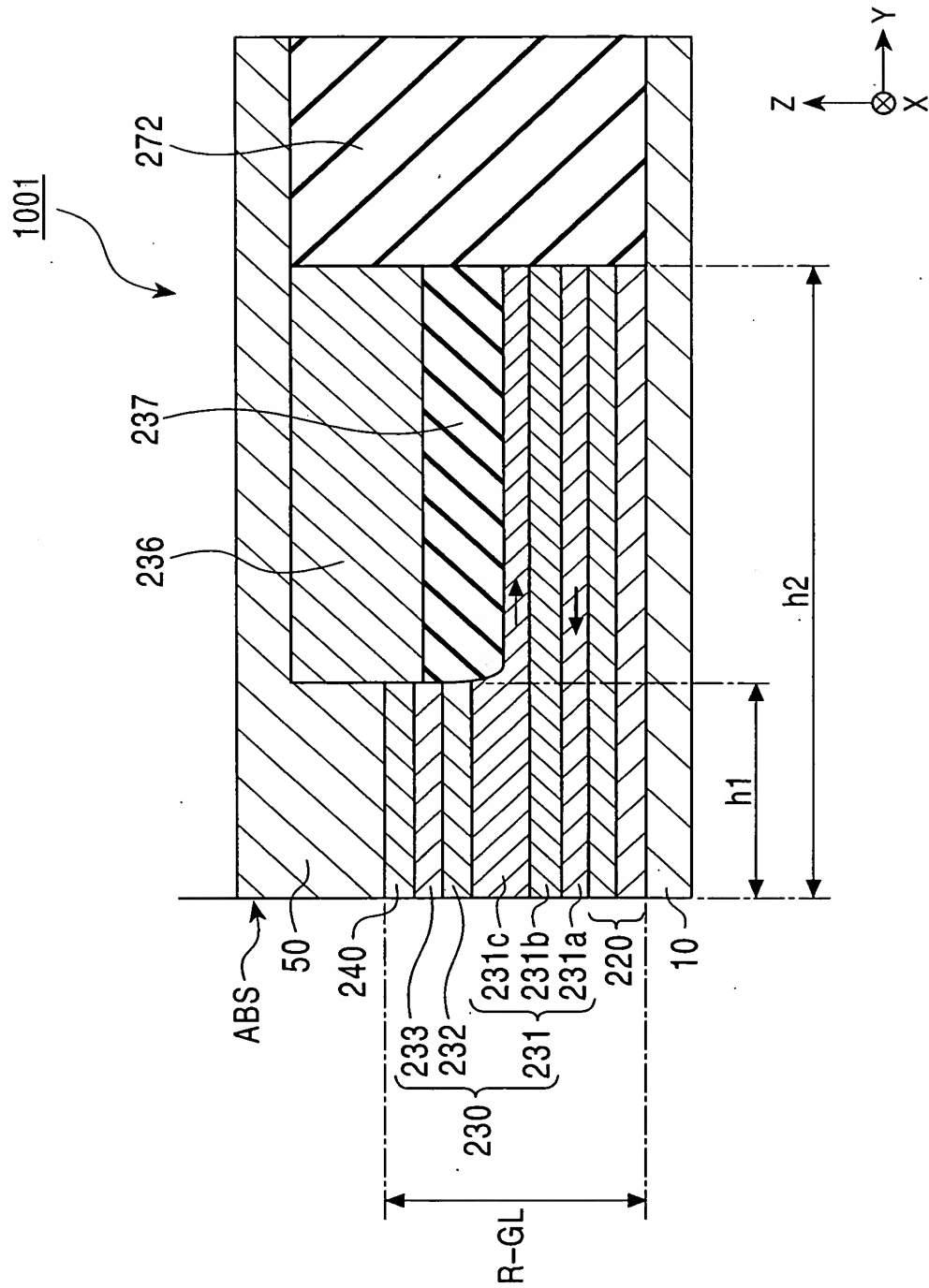
29 / 37

FIG. 42



30 / 37

FIG. 43



31 / 37

FIG. 44

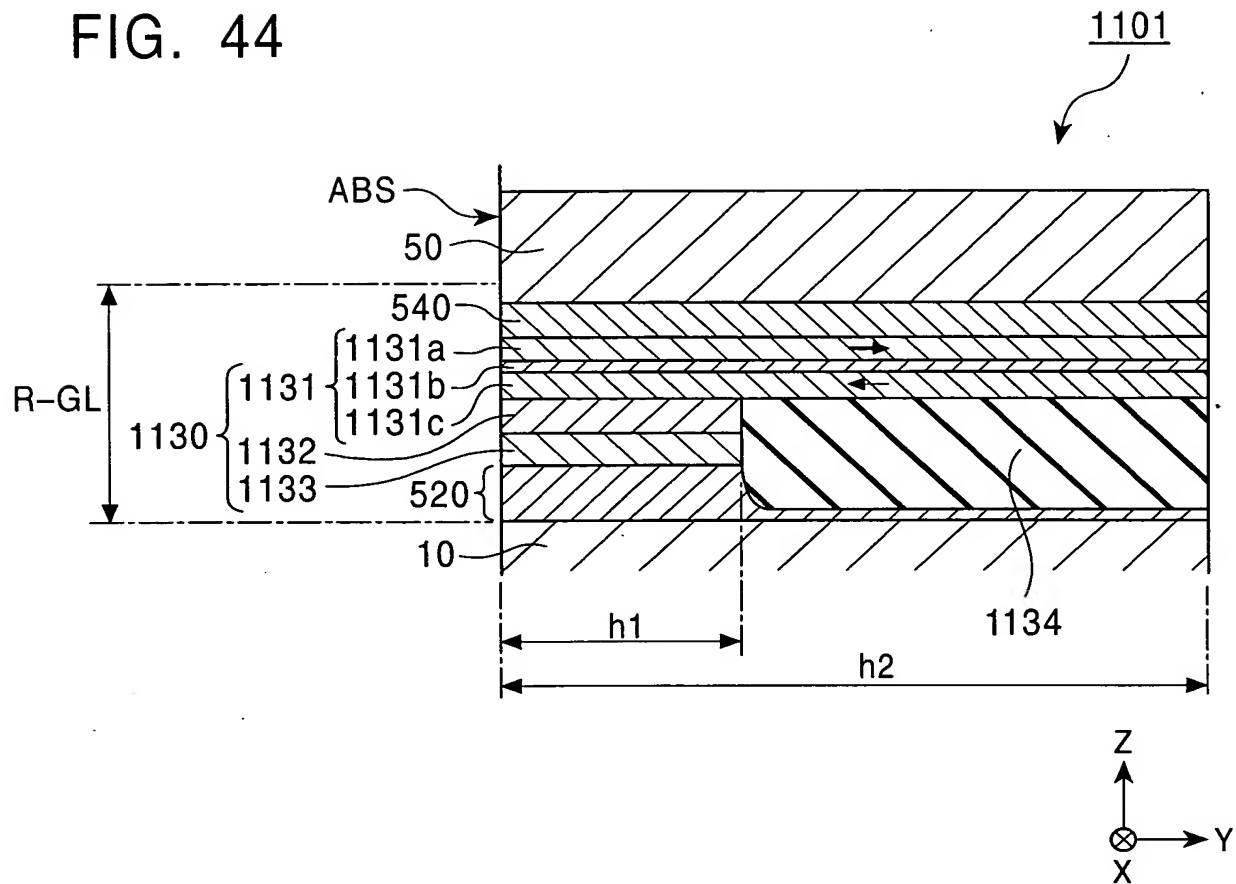
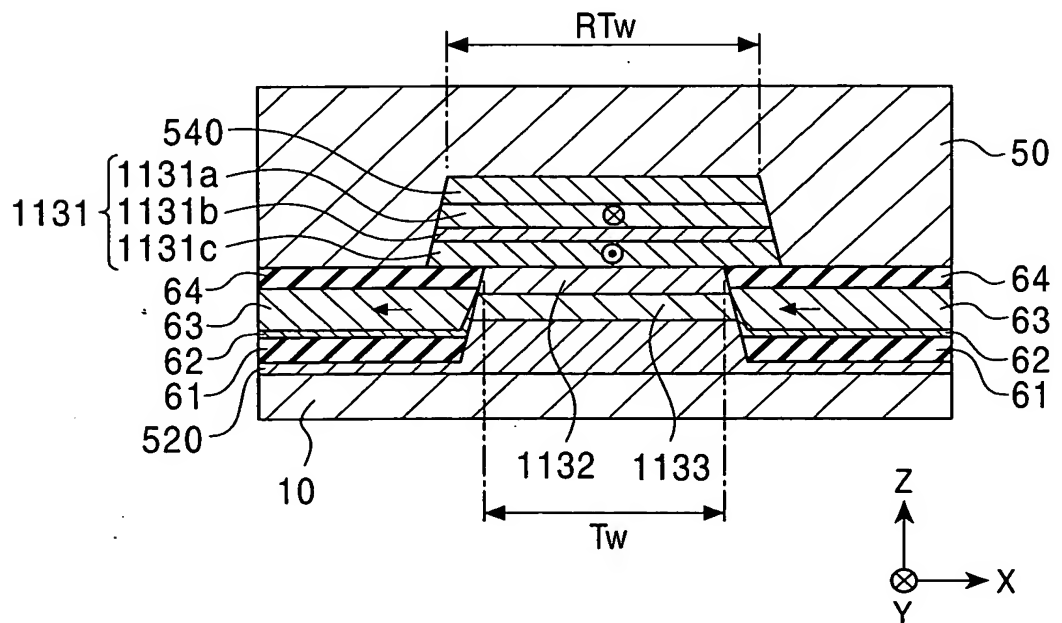


FIG. 45



32 / 37

FIG. 46

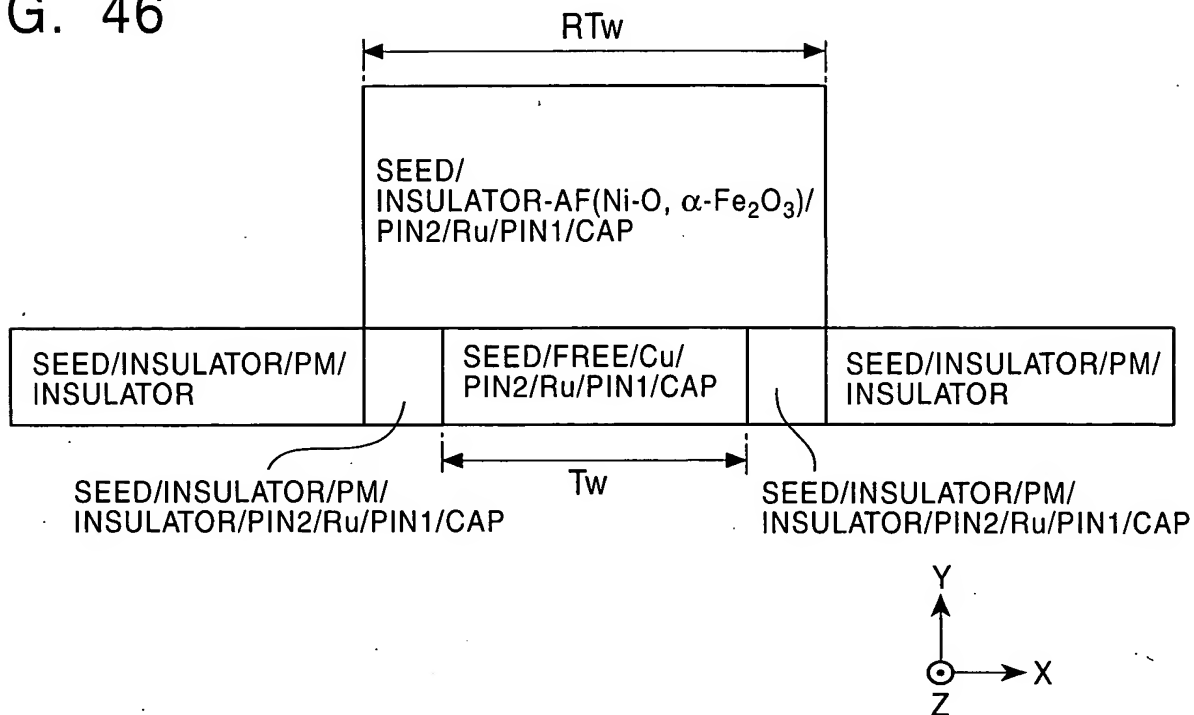
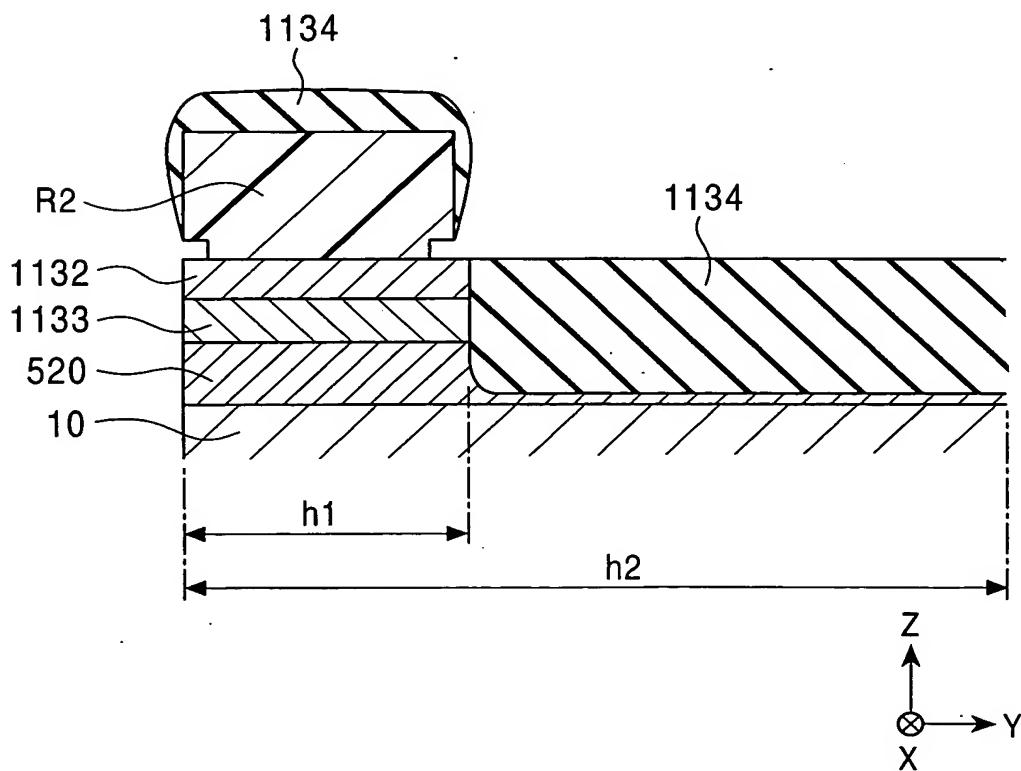


FIG. 47



33 / 37

FIG. 48A

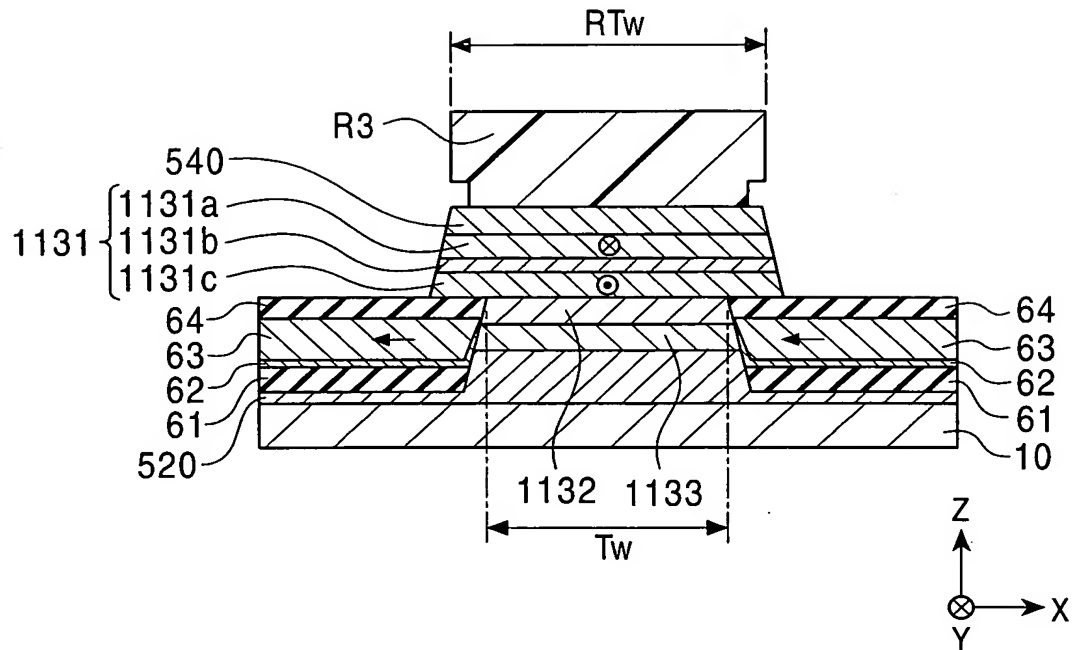
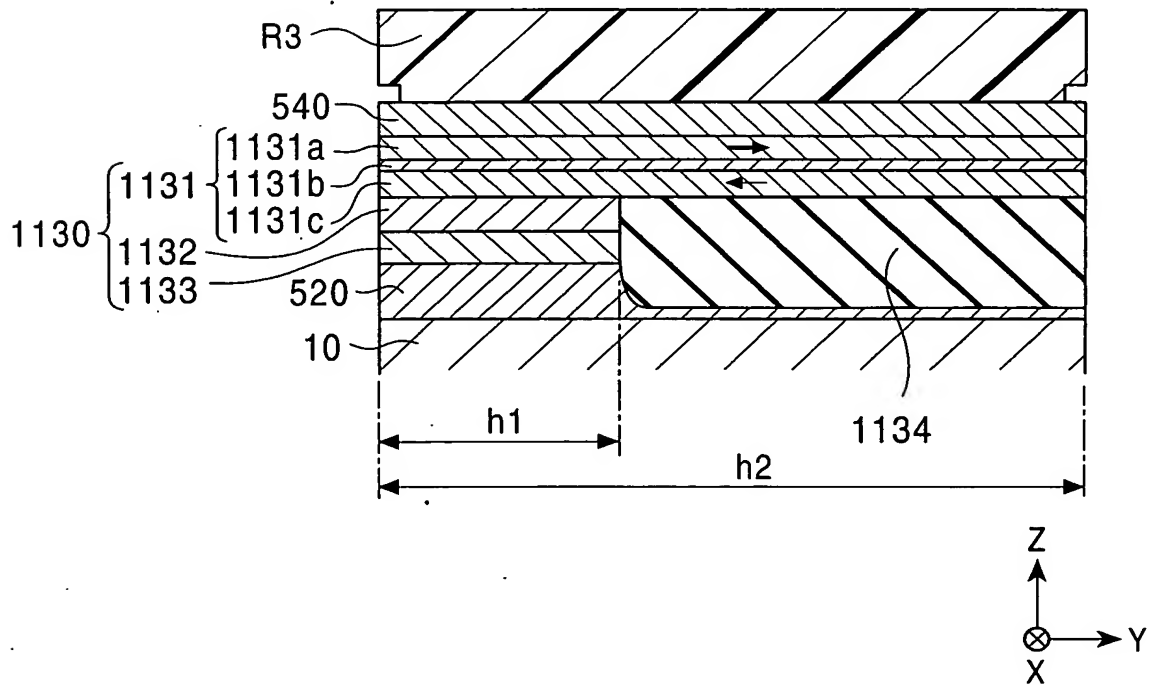


FIG. 48B



34 / 37

FIG. 49

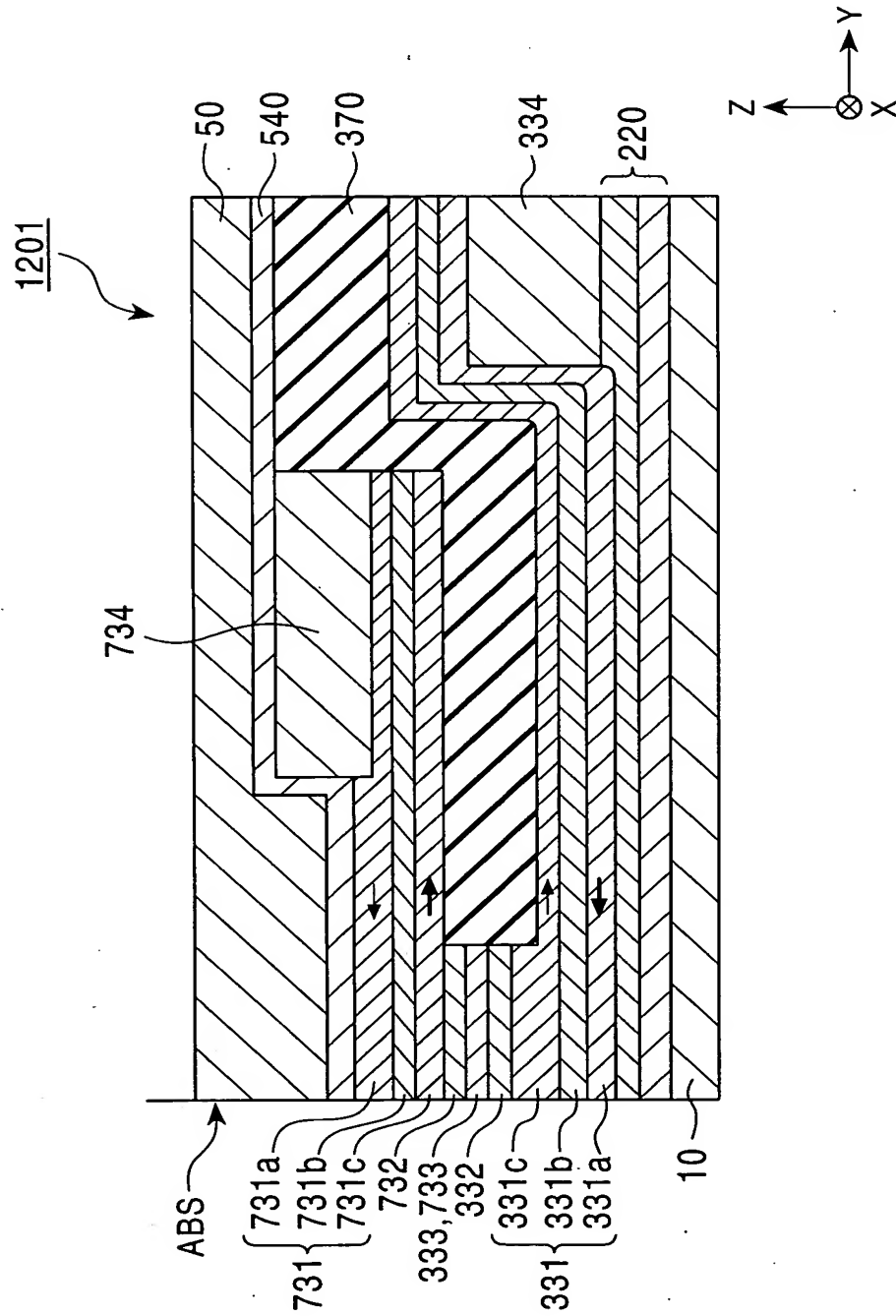


FIG. 50

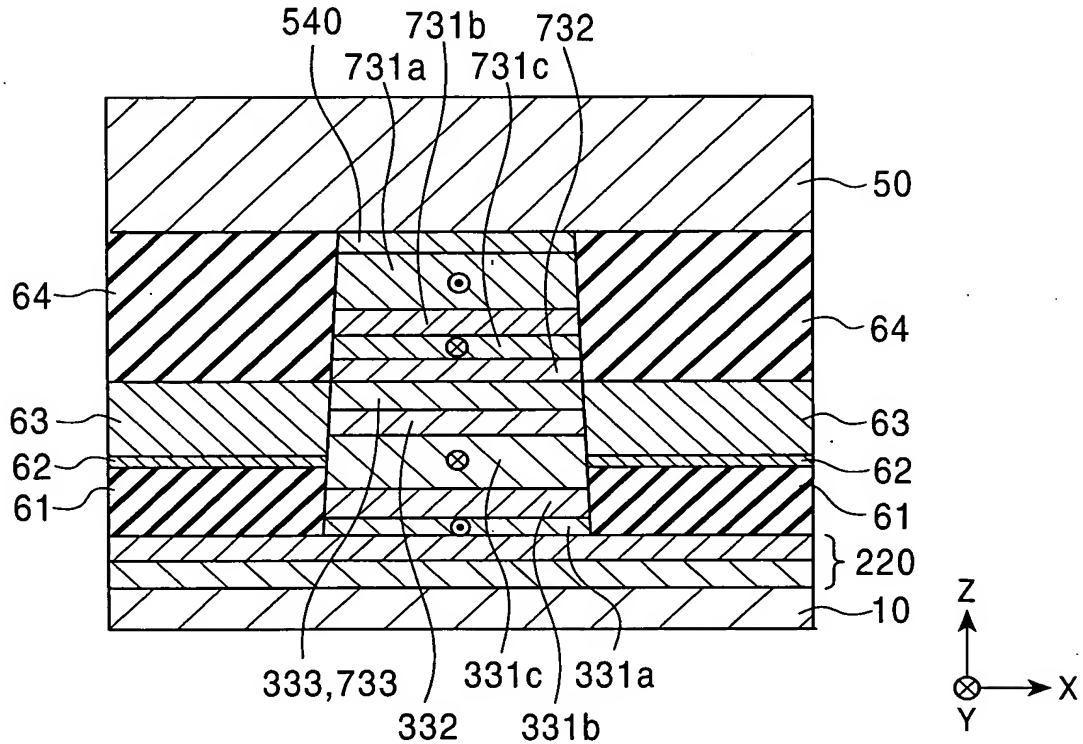


FIG. 51

Ta/Cr/INSULATOR/ HARD MAGNET/ INSULATOR	Ta/Cr/PtMn/PIN1/Ru/ PIN2/INSULATOR/Cu	Ta/Cr/INSULATOR/ HARD MAGNET/ INSULATOR
	Ta/Cr/PIN1/Ru/PIN2/ INSULATOR/Cu	
	Ta/Cr/PIN1/Ru/PIN2/ INSULATOR/PIN2/Ru/ PIN1/PtMn/Cu	
	Ta/Cr/PIN1/Ru/PIN2/ INSULATOR/PIN2/Ru/ PIN1/Cu	
	GMR ELEMENT	

36 / 37

FIG. 52

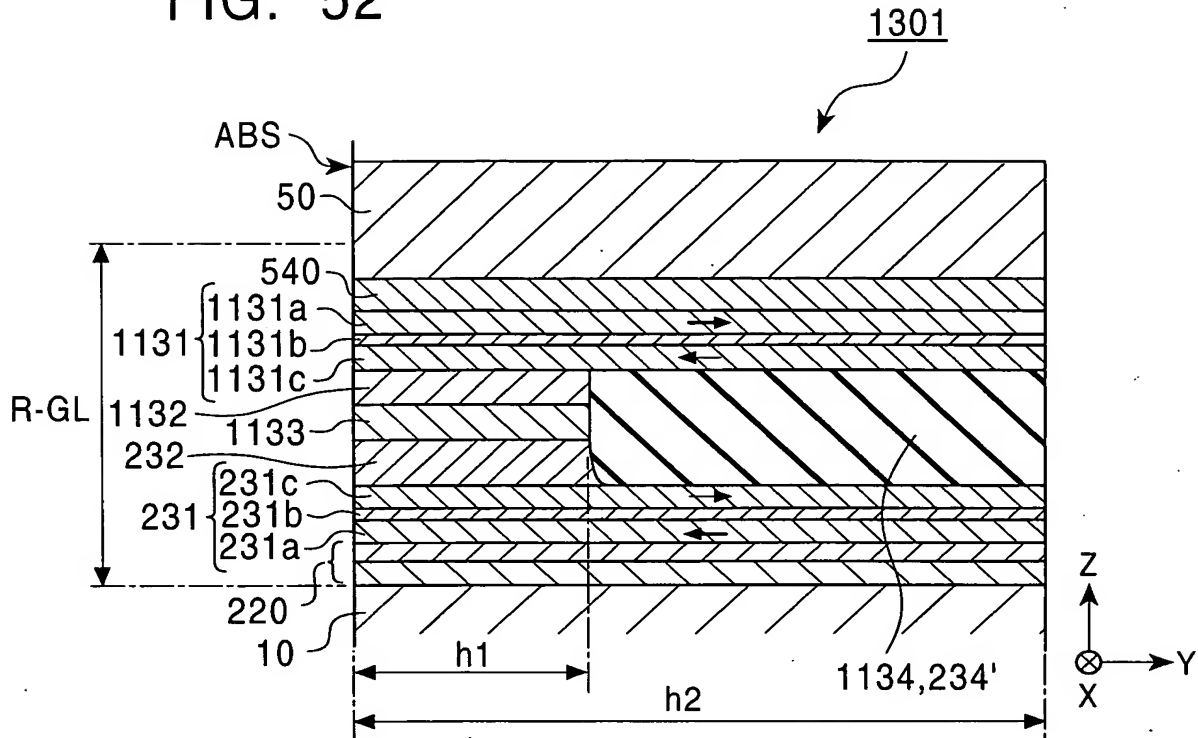
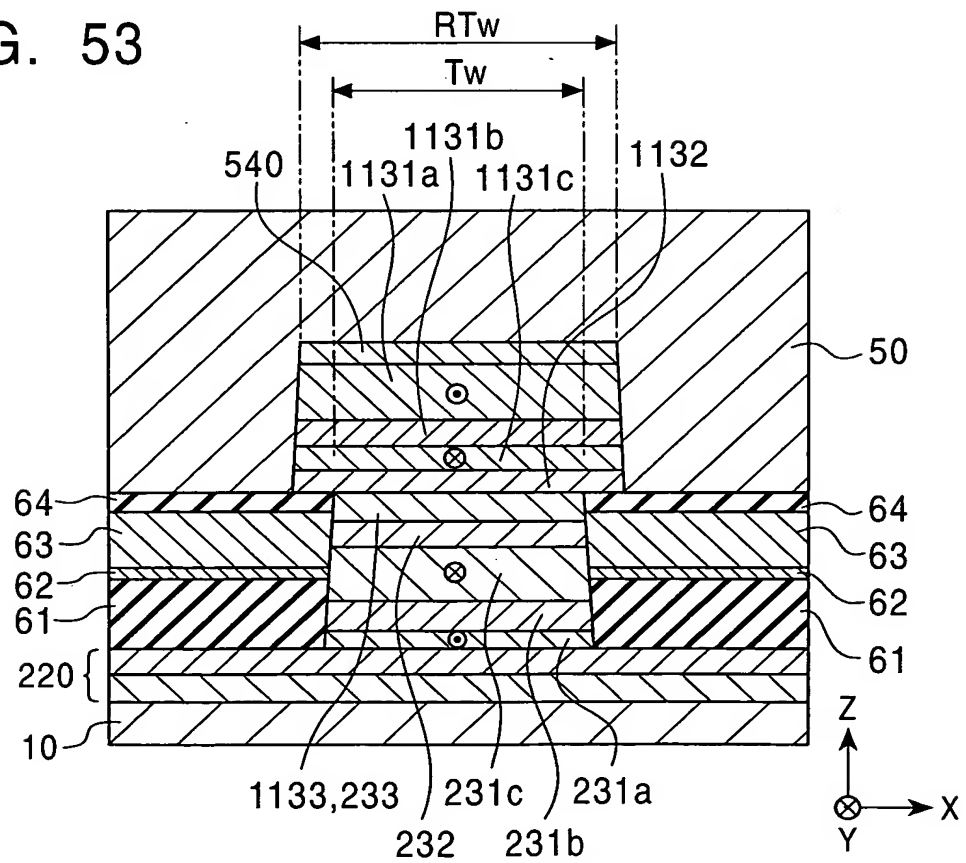


FIG. 53



37 / 37

FIG. 54

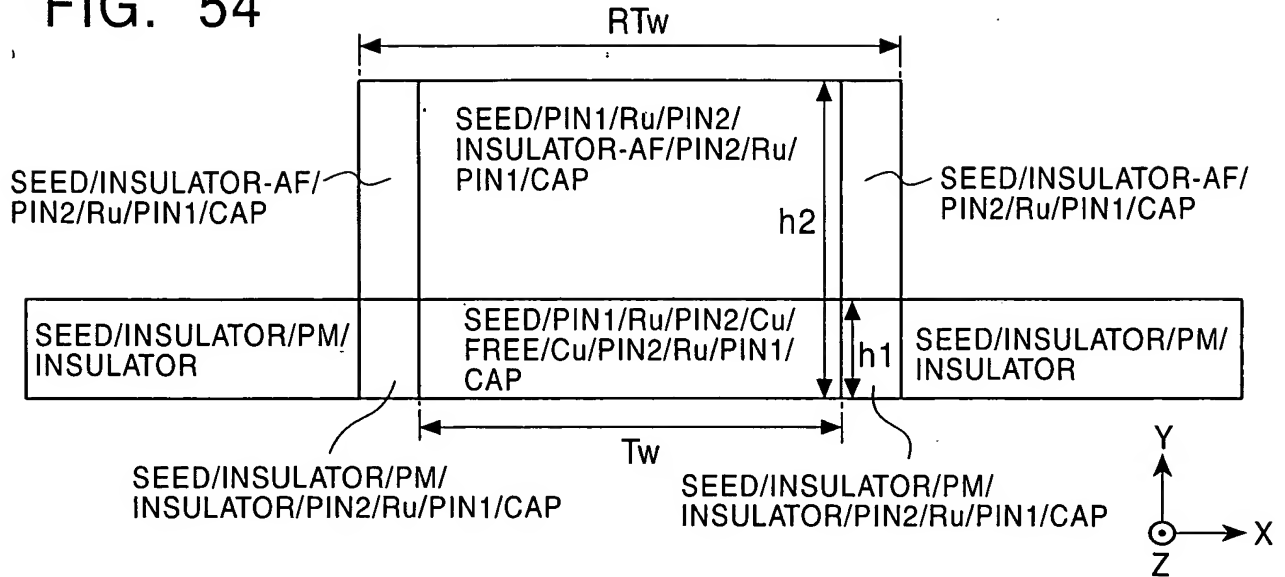


FIG. 55
 PRIOR ART

